The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Directorate of the B.D.C.

THIS issue of THE CHEMICAL AGE will have gone to press before the annual general meeting of the British Dyestuffs Corporation is held, and we are writing on the eve of the event. Apart from the general position and policy of the company, there are prospective changes in the directorate which should make the meeting one of unusual interest. A British manufacturer recently back from Germany informed us days ago that in Berlin a story was current that Dr. Herbert Levenstein would shortly retire. It is now openly announced that, subject to the approval of the shareholders at the annual meeting, both Sir Joseph Turner and Dr. Levenstein will cease to be managing directors; on the other side it is stated that both will stand for re-election. On the scientific and technical side these changes are of great importance, and an explanation of the reasons will be eagerly awaited. Dr. Levenstein is recognised as one of our most distinguished research chemists, and his colleague has had exceptional experience in the manufacture and marketing of dyestuffs in this country and abroad. The board have already accepted the resignation of Sir Harry McGowan, on account of the pressure of other duties, and have appointed as directors Sir William Alexander, Mr. G. Vernon Clay, and Sir William Robertson, who now retire (with Mr. G. P. Norton) and offer themselves for re-election.

As to the position of the company, the report for the past year shows satisfactory figures. The revenue available for distribution amounts to £610,927. After payment of dividends on the 7 per cent. preference shares and the 8 per cent. preferred ordinary, there is a balance of £203,304 which it is proposed to carry forward. The reason for this is obvious from some comments in the report. At present there is a very large stock of imported dyestuffs in this country awaiting consumption. Concurrently with increased importation, business in the textile and other industries consuming dyestuffs began to decline, culminating in the abnormal depression in trade existing at the present time. The profits for the past year, it is stated, were not largely affected by the above circumstances, as the effect both of the competition of imported dyestuffs and of the decline in trade only began to be felt towards the end of the period. These adverse conditions will fall with full force on the current year. The decreased demand for dyestuffs during the last few months has been very marked, and has rendered necessary a considerable curtailment in production. Stocks of raw materials have necessarily accumulated, and until trade revives will lock up an undue proportion of the Company's financial resources. Possibly, by the time these notes reach our readers, the position will have been more fully explained, but if the present condition of trade continues the company would appear to have an anxious year before it.

The Anti-Dumping Bill

THE Government's intentions as to the Key Industries Bill were not made any clearer by Lord E. Talbot's statement in the Commons before the Easter adjournment. On Tuesday next the business of the House includes "Committee stage of Financial Resolution of the Key Industries Bill," and on Wednesday "Report Stage of Financial Resolution of the Key Industries Bill." To an inquiry by Major Nall as to whether the Key Industries Bill includes anti-dumping legislation, Lord E. Talbot made the light-hearted reply: "I have a shrewd suspicion that that is another name for it." Again, when Sir W. Joynson-Hicks inquired whether the Bill would be published before the resolution the reply was: "It cannot be; the Bill is founded on the resolution." The procedure adopted is calculated neither to inspire confidence nor to smooth the passage of the Bill through the

House. The policy of the Bill involves matters of first-rate national importance, and if we are to have the measure supported by the public opinion of the country, it is necessary that its aims and methods should be disclosed and ample time allowed for their discussion. The country, we believe, is quite prepared to do what is really necessary for the salvation of our key industries; but it is becoming increasingly distrustful of secret diplomacy in these matters, and those responsible will have no right to complain if their case is ultimately prejudiced by want of frankness.

What the Government's real intentions are can only be inferred from statements made from time to time by advocates of the Key Industries Bill. Mr. W. J. U. Woolcock, M.P., in a vigorous plea for legislative action, states that all that industry asks is, first, time to replace the temporary plant hastily installed during the war, and secondly, some check upon a foreign exchange that reduces fair conpetition to a farce. This sounds so fair and moderate that one cannot imagine much opposition to it. But the prophecy as to results seems a trifle risky. "Given these," Mr. Woolcock says, "it will in return dot Great Britain with factories which will not only in large measure renew our commercial prosperity, but at the same time, unlike the Army and Navy, without a penny of cost to the State, keep in training our chemist reserve for the nation's defence." These are large hopes to encourage, and if they should be unrealized the disappointment will be correspondingly heavy.

On the eve of going to press the text of the Government's Financial Resolutions are published. Comment on these must for the moment be deferred.

A Synthetic Alcohol Invention

It was recently announced that a new process had been evolved for the production synthetically of alcohol on a commercial scale. The information given is decidedly lacking in completeness, but it would appear that the claim is put forward by Mr. G. O. Calvert, of the Metropolitan Laboratories, Twickenham. The process, it is stated, consists in the production of water gas from carbon (which, no doubt, refers to the ordinary commercial generation of water gas from coke), the water gas being passed through succeeding plant after being intermixed with other gases in accordance with the product desired, the alcohol being collected in a receiver. It is said that with the new process a yield, in such a case as that of methyl alcohol, of 80 per cent. of the theoretical maximum is obtained at an enormously reduced cost. The decrease in cost effected, in fact, would, it is claimed, enable alcohol as a liquid fuel to compete favourably with producer gas which, as is well known, has already been experimented with as a means for driving heavy moving vehicles. Our readers are, of course, well aware of the more promising and easily operated processes for producing alcohol in large quantities, and it is unnecessary to repeat that large scale manufacture would almost assuredly entail serious inroads on edible substances. If, therefore, a raw material such as coke (of which at the moment there are immense quantities about at a comparatively low price) could be used in lieu of foodstuffs, the most formidable obstacle in the way of alcohol production on a large scale would be removed.

Authoritative opinion inclines towards the view that as yet the details given by the inventor are far too meagre for any conclusive opinion to be given as to his claims; but they will, no doubt, be examined by the special Committee of the Department of Scientific and Industrial Research. We ourselves have no knowledge of the directions in which Mr. Calvert is working, but there may be some connection between his process and the well-known side reaction which in the process of reducing acetaldehyde to alcohol by the ordinary standard procedure of Sabatier gives rise to methane and carbon monoxide. Thus—

$$CH_3.\ CHO \rightarrow CH_4 + CO$$

A reversal of the above reaction would appear to give the desired result, the final product being obtained by passage of the aldehyde vapour in the presence of hydrogen (another water-gas constituent) over a contact agent composed of reduced nickel—

$$CH_3.\ CHO + H_2 = CH_3.\ CH_2OH.$$

The above, of course, is merely a suggestion as to what might be worked out. Providing the reversal of the first-named reaction could be accomplished fairly readily on a practical scale, then the initial products required are merely methane and carbon monoxide. The carbon monoxide is easily obtained in the water gas, but the methane remains a problem, unless—as dealt with in these columns a week or two ago—Mr. Calvert produces this synthetically from the carbon dioxide and hydrogen in his water gas. However, we must be modest with our theorising and await first-hand information.

Vindicating the "Middleman"

The conference on Irregular Training promoted by the Central Profiteering Committee has had at least one good result—it has produced emphatic testimony to the value of the "middleman" as a promoter and medium of trade. The testimony is not the less weighty because it arises from a misunderstanding. Chambers of Commerce and other trade associations took the inquiry to be rather against the "middleman," and protested against a conference being organised with the idea, as they understood, of eliminating him or undermining his legitimate business. It may be remembered that one of the most pointed protests was presented by the Chemical and Dyestuff Traders' Association.

These messages have evidently gone home, for the chairman of the Irregular Trading Conference makes it clear in a statement just issued that the value of the "middleman" in trade has never been in question at all. The sole object of the conference, he explained, was to determine whether, and to what extent, legitimate trading interests, including those of distributors, were being interfered with, and the purchasing public victimised by the existence of speculative intermediaries who had no regular interest in the trade concerned, but who simply took profits on goods which they seldom saw or handled, and with the nature of which they were often quite unacquainted, and who not only

contributed nothing to the convenience or welfare of the community, but were, in fact, mere parasites. Evidence, he added, went to show that many of these persons had no business premises, except perhaps a small office with a telephone and a typewriter, and that their operations had contributed considerably to instability of trade and high prices to the public, thereby injuring the legitimate trader as well as the consumer. The conference hoped that the associations who had shown their interest in this matter by protesting would now be willing to come forward and assist in an obviously necessary inquiry in the interests of the trades which they represented.

All this is excellent, and shows that the influence of the trader organisations is coming to be felt. The inquiry, however, seems to us to be a little late. The speculator flourished during the war, and his activities had admittedly an unwholesome and unsettling effect on trade. But he has practically disappeared, with a number of other fungus growths, and the inquiries which the Conference might perhaps profitably have conducted two years ago may now be left to official receivers and registrars. It is this mis-timing of a well-meant effort which probably accounts for the action of the Conference being so widely misinterpreted. The answer to the appeal to assist in an inquiry will probably be that there is little left of the war-time speculator to inquire into. If, on the other hand, the conference could induce Government departments to recognise and manufacturing combines to co-operate with the bona-fide merchant in the development of national trade, it might yet perform a most useful duty.

The Secret of Progress

AT a time when so many artificial devices for the development of British chemical industry are being offered, the advice which Sir Alfred Mond gave to the members of the Chemical Society last week is particularly welcome. In recommending scientific research as the key to the prosperity and progress of trade, he speaks not as a theorist or pure academician, but as the representative of one of the greatest industrial concerns in the world, which his father, working on the scientific side, did so much to establish, and which has won its present almost, if not quite, unique position by a perfect co-operation of scientific and commercial equipment. The great concern of Brunner, Mond & Co. is not the product of legislative enactments or of "most favoured nation" treaties; its success is due to its own merits, and especially to its wise employment of the scientific investigator, no less than of the commercial organiser.

Sir Alfred Mond may, therefore, plead with all the force of experience behind him for the fuller recognition in industry of the value of research, and we are glad to see that he pleads for pure research, which is the only form really worth the name. The real research, he says, like the arts, is born in one, and the important thing is to give to the worker the opportunity, free from care, to do what he thinks right, not what someone else may want him to do, for that is how the great discoveries of the world have been made. A great scientist, he thinks, is like a great poet, and, like a great prophet, his mind acts partly unconsciously and peers into the distance. This is a very different theory of research from that of the commercial man, who is prepared to spend 4d. on investigation only if he is sufficiently assured of receiving 9d. in return, and who is perpetually expecting his chemist to justify salary by producing results. The latter atmosphere is inimical to all true research, and it is comforting to have the witness of Sir Alfred Mond's experience and judgment to the truth that the research worker must be free to follow without distraction the lines opened up by his own patient and disinterested search for new truth.

An Incident of the War

THE retirement of Sir Marcus Samuel from the chairmanship of the Shell Transport & Trading Co., owing to ill health, recalls an incident of the war which had an important bearing upon its victorious termination. At a period when supplies of toluol were extremely scarce Sir Marcus allowed the British authorities to take considerably more than half the output of the Company's Borneo oil, which had been found to be remarkably rich in aromatic hydrocarbons. Although supplies of crude oil were now assured, there was no plant in this country where the manufacture of toluol could be undertaken. and the erection of one would have involved at least a year's delay. Sir Marcus therefore conceived a bold plan, which he immediately put into action. The Company's refinery at Rotterdam was dismantled and shipped to Bristol, where it was re-erected with the utmost despatch, and within two months toluol was being produced at the rate of nearly 900 tons per month.

The Calendar

Apl.		
2	The North of England Institute of Mining and Mechanical Engineers: General Meeting 2 p.m.	Newcastle-on-Tyne.
2	The Institution of British Foundrymen: "Safety in the Equipment of Foundries," by A. R. Bartlett. 4 p.m.	The College of Technology, Manchester.
4	Society of Chemical Industry (London Section). 8 p.m.	Burlington House, Piccadilly, London
5	Hull Chemical and Engineering Society: Presidential Address by Mr. R. A. Bellwood.	The Metropole, West Street, Hill.
6	Society of Public Analysts: Papers by F. G. H. Tate, J. W. Pooley; J. L. Lizius; T. F. Harvey, S. Back; S. Mallaneh. 8 p.m.	Burlington House, Piccadilly, London
6	Society of Public Analysts and other Analytical Chemists. 8 p.m.	—
7	Chemical Society: Lecture by Dr. F. W. Aston. 8 p.m.	Burlington House, Piccadilly, London
7	Chemical Society: "Mass Spectra and Atomic Weights," by Dr. F. W. Aston. 8 p.m.	Storey's Gate, Westminster, London.

Books Received

OPTICAL METHODS IN CONTROL AND RESEARCH LABORATORIES. London: Adam Hilger, Ltd. Pp. 30.

THE ELECTRONIC CONCEPTION OF VALENCE AND THE CONSTITUTION OF BENZENE. By H. Shipley Fry. London: Longmans, Green & Co. Pp. 300. 16s. net.

CHEMICAL TECHNOLOGY AND ANALYSIS OF OILS, FATS AND WAXES. By Dr. J. Lewkowitsch. Vol. I. London: Macmillan & Co., Ltd. Pp. 682. 36s. net.

Recent Progress in Rubber Chemistry and Technology—(V)

By Dr. Philip Schidrowitz

Properties of Vulcanised Rubber

While, during the past decade, a great deal of research work has been concentrated on the nature of rubber, and the theory and mechanism of the vulcanisation process as such, the trend of the most recent work has been towards investigation bearing on the effects produced on the physical, mechanical and ageing qualities of a mixing by various fillers, accelerators and so on. Thus Schippel* has made some exceedingly important observation on the *volume increase of compounded rubber under strain*. The method employed was that of ascertaining the specific gravity of a base mixing (suitably vulcanised), and to which varying qualities of different substances were added (*a*) before stretching, (*b*) after stretching over a series of graduated steel bars. In all cases, even at comparatively small elongations, a decrease in specific gravity (*i.e.*, a volume increase) was observed, but such decreases varied enormously. The determining feature seems to be the size of the particle, although at least one material (zinc oxide) appears to behave somewhat abnormally. Taking, for example 30 volumes† of different ingredients and stretching to an extension of 150 per cent. the following (percentage) increases in volume were observed :—

Base Mix (no addition)	.....	0·37 per cent.
,, +Barytes	.....	13·6 ,,
,, +Whiting	.....	3·5 ,,
,, +Lamp black	.....	1·41 ,,
,, +Carbon black	.....	1·01 ,,

It was calculated (by extrapolation) that a mixing containing 50 volumes of barytes would show an ultimate elongation of 550 per cent., and a volume increase at the break of 122 per cent., whereas a 100 volume compound of whiting would break at 375 per cent. elongation, and show a volume increase of 83 per cent. Schippel's theory is that with small volumes of a compounding ingredient the rubber, in most cases, "wets" or surrounds the particles more or less completely, and hence the decrease in specific gravity is small. With increasing quantities of the ingredient aggregates or agglomerates are formed, and the rubber tends to surround these aggregates instead of the individual particles. In most cases the minimum percentage at which marked volume increase commences is fairly sharply defined, but in some cases (*e.g.*, barytes) the increase is gradual, but observable from the smallest quantities, due, no doubt, to the fact that the particle is so coarse that the rubber is unable to surround it.

Effect of Various Ingredients on Abrasion and Resilience

Wiegand,‡ in a highly-suggestive communication on "Some Aspects of the Rubber Stress/Strain Curve," set out to determine the effect, and methods of measuring the same, of various ingredients towards certain essential qualities, namely abrasion and resilience. According to him "abrasive wear" (say in the case of a tyre tread) consists in the gouging or tearing out of small masses of rubber, due to impact upon the road surface ; a numerical measure of this impact is the *work done* on each little mass of rubber. If the work can be stored up without stressing the rubber to the point of rupture, the mass will stay in place. The less energy it will so absorb, the "easier it will be torn from its moorings." Now the work done ("energy of absorption," according to Wiegand) in stressing a piece of rubber is obviously represented by the area contained between the stress/strain curve, and the elongation axis. Wiegand measures this area, calculates the result to foot pounds per cubic inch of (original) rubber, and regards the figure so obtained as a measure of *abrasive wear*, or of "total energy of resilence." This theory assumes that road stresses on a tyre tread are purely "tensile," which is undoubtedly not the case, and the interpretation of the stress/strain curve in terms of "work done" is by no means novel ; nevertheless Wiegand's results are undoubtedly striking, and his conception as a whole of the problems involved is both ingenious and viewed from a new angle.

Materials which Increase "Energy Content"

Under the conditions of Wiegand's experiments it was found that certain fillers increased the energy of resilience, such increase being progressive up to a certain maximum. Carbon black, lamp black and China clay show a comparatively rapid increase to a peak, after which the curve falls away rapidly. In the case of zinc oxide which (probably on account of its markedly basic character) behaves abnormally, the maximum increase is maintained between approximately 6 to 20 volumes, subsequently declining rapidly. Red Oxide of Iron, Whiting, Fossil Flour, Barytes and Glue show no increase, but, after a brief neutral period, a rapid fall. According to Wiegand, specific surface of the particle, energy of resilience and volume increase are all functions of the degree of dispersion of the rigid pigment phase.

Expansion of Rubber during Vulcanisation

An interesting piece of work, particularly in view of the technical difficulties connected with moulding operations, has been published by Sanderson.* It was found that the greater the percentage of rubber in a mix, the greater the coefficient of expansion ; that prolonged mastication also increases expansion, but, on the other hand, the harder the (original crude) rubber, the smaller the expansion. The latter is an approximately linear function during the curing process, and no "kinks" on the curve are apparent. The increase of specific gravity resulting from vulcanisation of moulded articles is solely due to pressure, and not to contraction or to physical changes.

Testing of Rubber Goods

Considerable strides have been made in regard to the methods, whether chemical, physical or mechanical, which may be applied for the purpose of testing rubber or rubber compounds. From the factory point of view two of the most important requirements are : (1) A criterion of correct vulcanisation ; (2) tests accurately forecasting the behaviour of goods on "ageing." Neither of these problems can be regarded as completely solved, but although considerable headway has been made, the advent of the organic accelerator has materially complicated the problem.

"Correct" Vulcanisation Tests

(*a*) *In the case of simple mixings* (*e.g.*, of rubber and sulphur only) a criterion may be formed on the basis of the position of the stress/strain curve or of the combined sulphur. On the whole the physical method is probably the better one because, at any rate, it can be interpreted

* *J. Indust. and Eng. Chem.*, 1920, 12, 23

† No. of Volumes = $\frac{\text{per cent. by weight}}{\text{specific gravity}}$

‡ *Loc. cit.*

* *J. Indust. and Eng. Chem.*, 1920, 37-40.

in terms of the desired mechanical properties. Slow curing rubbers vulcanised to the correct technical condition will show a higher "combined" sulphur than rapid curing goods, and, it follows, therefore, that if we take as our standard a combined sulphur of say 2·75 per cent., the goods may actually be either over or under cured if the rubber itself deviates appreciably from the normal. It is true that in such a case it would be better to discard the rubber altogether and to search for a batch not deviating from the normal, because, although the stress/strain curve would indicate the correct cure, the ageing properties of the goods (owing to the abnormal length of cure required) might be abnormal. That is, so far as bulk operations are concerned; if we have merely in view the testing or grading of the rubber with a view to controlling deliveries, the stress/strain method is obviously preferable, not only for the reasons stated, but because the tests can be carried out in a comparatively short time.

(*b*) *Complex Mixings.*

In the case of complex mixings, particularly if considerable quantities of mineral accelerators (litharge, lime, &c.) are used, the degree of curing may, in many cases, be more accurately followed by the sulphur method than by the mechanical tests, inasmuch as the shifting of the curve over a small interval of time, and after a certain state of cure has been attained may be too slight to permit of a definite interpretation. At the same time the problem is complicated by the fact that accelerated mixings (particularly in cases where organic accelerators are used) show—at the correct technical cure—a lower combined sulphur than non-accelerated mixings.

The writer, in common with other workers,* has found that in mixings containing small proportions of sulphur the stress/strain curve, after progressing normally up to a certain point, begins to recede, such recession undoubtedly corresponding with an almost complete combination of the sulphur, and is indicative of over-heating, rather than of over curing. This point, then, may be definitely regarded as a definite standard of *excessive vulcanisation*, and as the modern trend is to work with small quantities of sulphur plus an accelerator, it may very likely be of direct utility as a curing criterion.

Ageing Tests—"Accelerated Ageing"

Vulcanisates which show the maximum breaking stresses have been found to age badly†; in other words—at any rate so far as certain types of mixings are concerned—we cannot, without more ado, get a direct line between the optimum mechanical properties immediately after curing and ageing qualities. In the case of new or experimental mixings we cannot with any certainty correlate the position of the stress/strain curve or the combined sulphur or any other property with behaviour on ageing, but as an indication of such behaviour, a so-called accelerated ageing test is frequently of utility. This consists in exposing specimens to a dry heat in a water oven either continuously or intermittently over a considerable time period and testing them from time to time for evidence of deterioration.

For this purpose a temperature of 65° to 70° C. and a period of 50 to 70 hours may be recommended. The degree of deterioration may be measured (1) by observing the shifting of the stress/strain curve and the alteration in breaking stress and elongation, "set," &c., and (2) by determining the increase (if any) of the acetone-soluble constituents, and of the combined sulphur. It must be remembered, however, that compared with normal ageing, the functional rôle of the free sulphur is probably considerably enhanced. Again, behaviour in ageing is largely dependent on conditions of use, and, whenever possible, ageing or wear tests should be designed to reproduce these so far as possible.

Chemical Analysis

Chemical analysis is employed in the rubber industry mainly (*a*) for controlling the quality of raw materials, (*b*) for controlling goods made to chemical specification, and (*c*) for "matching" goods of competitors. To a minor extent it is used in the control of processes. With regard to (*a*) and (*b*) the increasing use of such materials as glue, organic dyestuffs, organic accelerators, a whole range of gas and lamp "blacks," waste leather, fibres of various kinds and an ever-increasing variety of mineral fillers, resins, &c., has not made the task of the analyst an altogether enviable one, and the difficulties involved are enhanced for those whose labours are mainly in connection with (*c*). In the analysis of vulcanised rubber the well-known general scheme of analysis of Weber,* based on the work of Henriquez, has undergone some modification, but its main principles are still conserved. It has been recognised, for example, that pyridine is an unsatisfactory solvent for the determination of pitch, bitumen and similar materials, and that a short treatment with chloroform or carbon bisulphide is preferable. It must be admitted, however, that in view of the fact that bitumen, "mineral rubbers," and so on, absorb or combine with sulphur to a variable extent, and become partly insoluble, that their accurate determination is a well-nigh insoluble problem. The separation of "fillers" is generally carried out nowadays by means of a solution process in which nitrobenzene or petroleum, or a solvent such as xylene under pressure, is used, and progress in this direction may be regarded as reasonably satisfactory. The estimation of "rubber" is still, as a rule, carried out by difference, but a promising "direct" process has recently been published by W. K. Lewis and W. H. McAdams.† The process is one of bromination in which the substituted bromine is determined by a volumetric process and deducted from the total bromine, thus obtaining the true addition number (by calculation) of the rubber. The determination of "total" and "free" sulphur have been the subject of numerous pieces of analytical research, but so far as the "total sulphur" is concerned such researches are mainly the result of the desire of the rubber chemist for a method which is at once simple, rapid and accurate, an ambition which, it is hoped, will some day be satisfied. Meanwhile, we must still put up with the amenities entailed in working with generous quantities of strong nitric acid, the variable proclivities of the latter-day porcelain crucible to crack or not to crack, or the inconveniences (in a busy laboratory) of the caustic melt. The sodium peroxide ignition (so-called "rapid") methods works very well, if carefully handled, but it is not applicable to rubbers which cannot be obtained in a pulverulent form. Methods for determining glue‡ and cellulose, cork and leather§ have been elaborated by Epstein and Lange, and by Epstein and Moore, and some modifications have been suggested for various other determinations such as those of carbon black, carbonic acid, "true" free sulphur, sulphides, and so on. If the complete determination of the nature and quantities of the various materials employed in making a mixing cannot always be determined by analysis, the experienced rubber chemist can nevertheless, in most cases, get sufficiently close to the truth by bringing the synthetic method to bear on his analytical results. The latter may indicate a composition of, say, $a+b+c$ or of $a+b+d$ in quantities $x+y+z$ or $x+y+s$. A few trial mixings will then, as likely as not, eliminate the majority of the doubtful constituents and round off probabilities as to quantities.

* De Vries and Hellendoorn. *Archief*, 1918, 769; Schidrowitz and Goldsbrough, *India-Rubber Journal*, 1919, lvii, 269.

†*E.g.*, H. P. Stevens, *J. Soc. Chem. Ind.*, 1916, 35, 872. The mixings used, however, contained a high proportion of sulphur.

**The Chemistry of India Rubber*. London: Chas. Griffin. 1902.

†*J. Indust. & Engin. Chem. and I. R. World*, August, 1920, p. 727.

‡*India Rubber World*, 1920, 216-217.

§*India Rubber Journal*, March 27, 1920, 539.

Mechanical Testing

As a result of improved technique, considerable progress (as will have been gathered from some of the proceeding sections) has been made in connection with the physical and mechanical testing of rubber. Much, however, remains to be done; for instance, we have so far no reliable methods of determining such qualities as "toughness," resistance to abrasion, to tearing or torsional stresses, and so on, more particularly with regard to practical conditions. So far as "tensiles" are concerned, mechanical testing has been much simplified and improved by the introduction of the ring test-piece and of a practical method (*e.g.*, in the Schopper machine) of rotating the ring during the test. Certain theoretical objections to the ring test-piece have been advanced by the U.S. Bureau of Standards.* It was pointed out that owing to the unequal distribution of stress across the section, rings cannot give true breaking stresses. In stretching, the inner portion of the ring will be strained to a greater extent than the outer part, and while the elongation measured is that of the inner surface, the stress measured is an average over the cross section. It is further the fact that the relation *true stress: stress measured* varies for different qualities of rubber. With regard to these objections (which in practice may be minimised by using a comparatively thin ring) it must be remembered that in practical work, as a rule, comparisons are instituted between similar rubbers and not between specimens differing widely in composition. If stress can be more accurately measured by means of the straight (dumb-bell) test piece, elongation is far more readily and accurately obtainable with the ring, and so far as the ascertaining of the relation stress/strain during the stretching operation is concerned (*i.e.*, the determination of the stress/strain curve) no other convenient method is so far available. The writer for some years past has held and expressed the view which is well voiced by Whitby† when he says, "The whole tendency of recent experience in rubber testing is . . . as against the former almost exclusive concern with the breaking point figures, the importance of the whole stress/strain diagram."

CORRECTION.—In Article IV., p. 354, 1st col. last paragraph (headed "Single & Double Process Covers"), the first sentence should read:—"On the whole it may be said that the trend of manufacture in the case of tyres with simple treads is in the direction of the 'single process.'"

German Reparation (Recovery) Act

Advisory Committee Appointed

THE German Reparation (Recovery) Act, which took effect from Thursday, provides that the Board of Trade may, by order, vary certain provisions of the Act in the manner prescribed in section five, but such action is to be taken only on the recommendation of a committee whom they are to appoint, consisting mainly of persons of financial, commercial, or industrial experience. The following committee has accordingly been appointed by the Board: Mr. H. A. Trotter, Deputy-Governor of the Bank of England (chairman), Mr. H. B. Betterton, M.P., C.B.E., Mr. F. R. Davenport (of Willans & Robinson, Ltd., Rugby); Mr. Stanley Machin, President of the London Chamber of Commerce; Mr. D. Withers, Foreign Branch, London County, Westminster and Parr's Bank, and Captain G. W. Duncan (secretary).

Applications to the Board to make any order under any of the provisions referred to should be addressed to the secretary, Board of Trade, Great George Street, Westminster, and both the letter and envelope should be marked "German Reparation."

As a result of experiments extending over two years A NEW POTASSIUM FERTILISER, known as electro-potash, is being placed on the market by Swedish firms.

* Circular No. 38. † *Loc. cit.*, p. 268.

Research Work at the Universities

Chemistry and Bio-Chemistry

IN a review of the progress of research work in the universities, a writer in *The Times* states:—

"To be truly progressive, or even to retain his freshness, it is essential that a teacher should have facilities for original investigation. This applies equally to all studies and provides the first reason why the universities are so anxious that the claims of pure science are not overpowered by those of applied. In the second place, advance in applied science is necessarily dependent on a previous advance in pure: of this, if proof were needed, the war supplied proof in plenty.

Physics

In many branches of their research the pure sciences are taking their cue from the problems raised and only partially solved during the war. Physics has a large field opened to it in wireless telegraphy and telephony, and under the Radio-Research Board experimental stations have been established at Bristol, Leeds and Newcastle (among other places) to work on the many difficulties of reception. The uses of the thermionic valve are being widely extended for instruments in which a high degree of accuracy and intensification is required, as at Leeds for Professor Whiddington's apparatus, which renders audible the beats of the heart, and at Bristol for especially sensitive pressure gauges. In another and more fundamental branch of physics Professor Bragg at Manchester is working on the atomic structure of crystals, while at Bristol Professor Tyndall, also on the atomic principle, is engaged on the theory of the arc lamp, and the carriers of electricity in the arc, and on X-ray experiments.

Chemistry

Chemistry, in the universities which are in close contact with the textile industries, is largely concerned with the production of synthetic dyes, and especially with the discovery of intermediates, which have been the main difficulty of English chemists hitherto. For several months Leeds and Manchester placed laboratories at the service of the British Dyestuffs Corporation, whose chemists, working under the university professors, have done some very valuable research. At Manchester the chemical department has also been employed by the Government for investigations into the practical possibilities of alcohol and other liquid fuels, and, under the Food Investigation Board, has conducted research in fats and oils. The universities are indeed freely used by Government Departments for research purposes, and during the war the chemical departments of all were mobilised for munitions work: novocain and other German drugs, antiseptics, poison gases, explosives, and shell varnishes were a few of the products of the Leeds and Sheffield laboratories alone.

Bio-Chemistry

One of the most interesting developments of organic chemistry, and also the most important in its bearing on the whole of biological studies, has been the advance of bio-chemistry, which, to give it a broad definition, is concerned first with the normal chemical processes of plant and animal life, and, from a knowledge of these, proceeds to the abnormal processes which express themselves in ill-health and disease. Many conspicuous successes were obtained in this branch of science during the war, among which the work of Dr. Henry Dakin, a graduate of Leeds, a post-graduate student of the Lister Institute, and now Director of the Herter Laboratory in New York, can claim special credit. The pronounced disinfecting properties of bleaching powder had long been known, but its irritant qualities rendered it impossible for surgical use. By his research Dr. Dakin nullified these irritant qualities, and made possible its application to open wounds. An outcome of this discovery was the green-coloured gauze so familiar in military hospital wards. Chairs of bio-chemistry have already been founded at Oxford, Cambridge, Edinburgh, Glasgow and London, and, among the newer universities, at Liverpool, where research on proteins is in progress. The rest badly need such chairs, but are not waiting for their establishment to prosecute their research. Bio-chemistry is an especially strong point of Bristol, where Dr. Nierenstein, who, during the war, did valuable work on blackwater fever, found in some cases to follow quinine treatment, has recently succeeded in synthesising catechin, and is now working on the chemical colouration of plants and on plant metabolism.

Government Anti-Dumping and Key Industries

Text of Financial Resolutions

THE terms of the Government's proposals for dealing with anti-dumping and the protection of newly established key industries have been eagerly awaited for some time. These are now disclosed in a White Paper (Cmd. 1,219), issued on Wednesday, which prints under the heading, "Safeguarding of Industries," the following "Proposed Way and Means Resolutions" to be discussed in the House of Commons next week :—

Resolution I.

That for a period of five years from the passing of an Act for giving effect to this Resolution there shall be charged on any of the following articles imported into Great Britain or Ireland a Customs duty of an amount equal to 33⅓ per cent. of the value of the articles, that is to say :—

(*a*) Optical glass and optical elements, whether finished or not, microscopes, field and opera glasses, theodolites, sextants, spectroscopes, and other optical instruments.
(*b*) Beakers, flasks, burettes, measuring cylinders, thermometers, tubing and other scientific glassware, and lamp-blown ware, evaporating dishes, crucibles, combustion boats and other laboratory porcelain.
(*c*) Galvanometers, pyrometers, electroscopes, barometers, analytical and other precision balances, and other scientific instruments, gauges and measuring instruments of precision of the types used in engineering machine shops and viewing rooms, whether for use in such shops or rooms or not.
(*d*) Wireless valves and similar rectifiers, and vacuum tubes.
(*e*) Ignition magnetos and permanent magnets.
(*f*) Arc-lamp carbons.
(*g*) Hosiery latch needles.
(*h*) Metallic tungsten, ferro-tungsten and manufactured products of metallic tungsten and compounds (not including ores or minerals) of thorium, cerium, and the other rare earth metals.
(*i*) All synthetic organic chemicals (other than synthetic organic dyestuffs colours, and colouring matters imported for use as such, and organic intermediate products imported for their manufacture), analytical re-agents, all other fine chemicals and chemicals manufactured by fermentation processes ;

including any articles comprised in any list which may from time to time be issued by the Board of Trade for defining the articles which are to be taken as falling under any of the general descriptions set out above.

Resolution II.

There shall be charged on any of the following articles imported into Great Britain or Ireland, in addition to any other duties of customs chargeable thereon, a customs duty of an amount equal to 33 1·3 per cent. of the value of the article, that is to say :—

Articles of any class or description in respect of which an order by the Board of Trade has been made under any Act of the present Session for giving effect to this resolution, if manufactured in whole or in part in any of the countries specified in the Order, or deemed to be so manufactured.

Any such Order as aforesaid may be made on the ground that articles of the class or description in question are being sold or offered for sale in the United Kingdom—

(*a*) At prices below the cost of production thereof ; or
(*b*) At prices which, by reason of depreciation in the value in relation to sterling of the currency of the country in which the goods are manufactured, are below the prices at which similar goods can be profitably manufactured in the United Kingdom ;

and that by reason thereof employment in any industry in the United Kingdom is being or is likely to be seriously affected.

For the purposes of this resolution, "cost of production" in relation to goods of any class or description means the current sterling equivalent of—

(*a*) The wholesale price at the works charged for goods of the class or description for consumption in the country of manufacture ; or
(*b*) If no such goods are sold for consumption in that country, the price which, having regard to the prices charged for goods as near as may be similar when so sold or when sold for exportation to other countries, would be so charged if the goods were sold in that country.

Notes on the Resolutions

These resolutions will be submitted to the Committee of Ways and Means, and will, if passed, be given effect to in this year's Finance Act. The resolutions indicate three forms of protection, stated in general and rather wide terms, which may be expressed with more exactness when they come to be embodied in a Bill.

In the first place, it is proposed to levy for a period of five years 33⅓ per cent. *ad valorem* duty on certain commodities, no matter from which country they may be imported. These commodities include chemical and scientific glassware, magnetos and tungsten products. These articles come chiefly from Germany, and are already subject to a 50 per cent. tax under the Reparation Recovery Act.

The second form of protection is designed to check dumping—*i.e.*, the selling of goods here below the cost of production in the country of manufacture.

The third form of protection is designed to protect British manufacturers against competition of foreign goods which, owing to depreciated currencies, can be sold in this country at prices below those at which the goods can be profitably manufactured here. Competition of these two kinds is to be met by an additional Customs duty of 33⅓ per cent. Thus, in the case of German magnetos the resolutions, if passed, would impose duties which, including the 50 per cent. tax might amount to 116 per cent.

While the first resolution fixes five years from the date of the passing of the Bill as the period during which the duty on the articles mentioned shall be charged, no time limit is specified in the second resolution relating to goods dumped in the United Kingdom ; but the Bill will probably specify the length of time during which an Order made by the Board of Trade under the anti-dumping or depreciated exchange clauses will be operative.

Creosote for Canada

H.M. TRADE Commissioner in Canada reports that an inquiry has been received for the names of United Kingdom firms in a position to supply creosote in large quantities. It is stated that at present the inquiring firm are obtaining their requirements of creosote to the extent of about 53,000 gallons per month from the United States. This arrangement is, however, unsatisfactory as the source of supply is not reliable and the creosote cannot be obtained in the desired quantities. The applicants are prepared to order in shiploads at a time if necessary as they have orders on hand for creosoting railway ties for the Indian market which will take them about two years to complete. They are very anxious to obtain their entire supply from the United Kingdom, but they are not prepared to pay more than they are at present paying. Terms are to be cash against documents, Canada. Draft to await the arrival of goods, or preferably to be drawn at 30 days. The name and address of the firm referred to may be obtained on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

The duties leviable on creosote imported into Canada are given in the Canadian Customs Tariff as follows :—heavy creosote oil, free ; creosote oil, 15 per cent. *ad valorem* (British Preferential Tariff). A scales tax of 10/o on the duty paid value is also levied in each case.

The next ordinary scientific meeting of the Chemical Society will be held on Thursday, April 7th, at 8 p.m., at the Institution of Mechanical Engineers, Storey's Gate, Westminster, when Dr. F. W. ASTON will deliver a lecture on "Mass Spectra and Atomic Weights."

Materials of Construction Used in a Chemical Works—(I)

By George B. Jones, A.M.Inst.C.E., A.I.C.

The following article deals with a subject upon which, as it directly concerns the chemist, very little literature has appeared. Perhaps, the appearance of structures in many of our older chemical works is the best illustration of the fact that the choice of structural materials has not always been as happy as it might have been.

A LARGER variety of materials is used in a chemical works for the construction of buildings and plant than in any other industry. The properties, uses and limitations of any particular material are often very incompletely investigated. The available literature is very meagre, and without special study the general engineer has very little knowledge of the special conditions and requirements met with in all chemical works. I propose to discuss briefly some of the conditions which face an engineer when designing chemical plant, and to describe more fully the properties of some of the special materials which are used.

All engineering materials used in a chemical works have to be viewed from three main aspects :—

1. Physical properties, *e.g.*, strength, weight, hardness, soundness, adaptability and action under changes of temperature, &c.

2. Economics, *e.g.*, first cost, durability and available markets, &c.

3. Chemical properties, *e.g.*, composition, the action of chemicals under normal and extraordinary conditions, &c.

The first of these groups, physical properties, has been well investigated as far as the ordinary materials of construction are concerned, and reliable information is readily available from tables and standard engineering works. Special materials have not been so well examined, and many materials which are excellent corrosion resisters fail in physical properties, due to lack of strength or soundness. It is important, however, that specifications should be drawn up, and care taken that deliveries are up to standard. A generous factor of safety must be taken when calculating sections, so as to allow for severe conditions.

The second group, economic considerations, depend largely on local conditions. The life of a particular piece of chemical plant is often very short, due to rapid corrosion or frequent changes in manufacturing methods which necessitate new plant. It is often a mistaken policy to make all the parts of a plant of too permanent a nature. Of course, cheap flimsy construction is an equally mistaken policy, but the engineer should have a clear idea of the probable economic life of the plant, and avoid expensive masses of concrete and brickwork, &c., which are not likely to have any scrap value when the plant is altered or dismantled. This consideration applies more particularly where the capital charges of the plant form a considerable proportion of the total cost of the product manufactured. The ratio of the capital charges to the total cost of manufacture is remarkably diverse for various chemicals.

The third group, the chemical properties, are the most difficult to handle. There is very little theoretical knowledge, and there are very few rules to guide a designer. Experiment and experience are essential to produce successful results. Very small variations in the chemical composition of a particular material may greatly alter both its physical properties and its behaviour when in contact with corrosive chemicals. The general action of chemicals on materials of construction is very complicated and difficult exactly to define and specify for any particular case, for changes of conditions, such as temperature, pressure and concentration, each modify the the action in almost unlimited combinations. This corrosive action is often so serious that the design and construction of a piece of apparatus is entirely governed by it, and the first two groups of properties are hardly of any account in fixing the particular material to be used.

Influence of Temperature

The range of physical conditions which materials are called upon to withstand is only limited by the ability to produce and control extremes. Take temperature, for instance; many industrial chemical operations have to be carried out at temperatures well below the freezing point of water; while at the other end of the temperature scale is the electric arc furnace for which special refractory material has to be provided, of an acid, basic, or neutral character, depending on the reaction taking place. As regards pressure, there are stills and dryers working under the highest obtainable vacuum, and the great steel bombs in which ammonia is oxidised to nitric acid, and autoclaves where pressures up to 15,000 lbs. per square inch have to be controlled. Extremes in electrical conditions also are becoming more prominent; the electrical precipitation of dust particles and mists requires currents at pressures up to 100,000 volts, which necessitates special insulators to withstand the action of corrosive chemicals.

Corrosion

The corrosive action of certain chemicals on materials of construction is undoubtedly the greatest special difficulty met with in designing and maintaining chemical plant. Indirectly the chief enemy is water, for as a general rule corrosive chemicals are soluble in or miscible with water, and the greater the dilution the greater the corrosive action. One of the most difficult problems in chemical plant design is to handle large volumes of dilute acids successfully and cheaply. Strong acids can be fairly successfully handled either hot or cold. Dry acid gases or fumes also present no very special difficulties, but water-saturated acid gases at temperatures below the dew point require very special materials to hold or convey them.

The whole question of corrosion is so dependent on the chemical and physical composition of the exposed materials that the life of any particular piece of apparatus is very difficult to predict. To obtain consistently good results the material must be of perfectly uniform composition, free from physical defects, and not exceeding in composition maximum quantities of certain specified injurious constituents. A brief consideration of the action of common acids on lead, cast-iron, and steel will illustrate these points.

Lead.—Hydrochloric acid should never be used in contact with lead. Nitric acid above 80 per cent. can be handled in lead vessels safely in the cold only; hot or dilute nitric acid has a vigorous action on lead. Dilute sulphuric acid is best handled in lead vessels in preference to all other materials, but the acid must not contain any considerable quantities of nitric or hydrochloric acid, for in this case the action is severe. Sulphuric acid of above 80 per cent. strength should not be boiled in lead vessels, and for acid over 92 per cent. cast-iron is less acted on than lead. Sulphuric acid of over 99 per cent. and oleum which is 100 per cent. sulphuric acid with free sulphur trioxide, should not be exposed to lead as cast-iron and steel are less acted upon at these strengths. For apparatus such as tanks, pipes, chambers, &c., that are never exposed to a temperature exceeding 200°C., the purest soft lead gives the best results with sulphuric acid, dilute or concentrated. Soft lead should not contain more than 0·005 per cent. antimony, 0·002 per cent. bismuth, and only the very smallest traces of other impurities. For temperature above 200°C. 0·1 to 0·2 per cent. copper improves the resisting qualities, but antimony and bismuth should be absent to give the best results. Hard lead containing 1 to 2 per cent. antimony, and regulus metal with 7 to 18 per cent. antimony, are useful for cocks, plugs, seats, &c., to resist mechanical wearing, but are more readily attacked than pure lead. Sheet lead is liable to local defects, which develop into holes, and it requires careful rolling during manufacture, and inspection before use. Cast-lead is very liable to have a loose crystalline structure with consequent acid leakage.

Cast Iron.—Cast iron resists acids much better than wrought iron or steel. Hydrochloric acid severely attacks cast iron, but hot hydrochloric acid gases above the dew point are safe to pass through cast-iron pipes. Nitric acid above 90 per cent. can be treated in cast-iron vessels, but any dilution causes a severe action. Dilute sulphuric acid attacks cast iron more readily than lead, and cast iron should not be used for acid below 62 per cent. strength in the cold, but boiling acid of strength below 92 per cent. should not be handled in cast-iron vessels. Strong sulphuric acid of 92 to 100 per cent. has very little action on cast iron, even at boiling point. Cast iron is

not much attacked by oleum, and can be used for pipe lines and open vessels, but oleum should not be used in cast-iron vessels or pipes under pressure, as the acid penetrates the pores of the metal, and is liable to cause sudden cracks, and sometimes an explosion. Mixtures of sulphuric and nitric acids containing up to 25 per cent. water have very little action on cast iron, but are liable to cause sudden failure under pressure. Nitric acid with at least 15 per cent. sulphuric acid can be safely handled, but the corrosion of the iron or steel depends upon the amount of sulphuric acid and water present, so that no general rule can be given. It is difficult to give a chemical specification for an acid resisting cast iron, but one with a high content of combined carbon seems to resist corrosion. The best examples come from foundries that specialise in chemical plant castings, and the best results where old castings are worked up for replacements. Cast iron usually fails locally, or cracks, rather than corrodes away like lead and steel. The castings should be of uniform thickness, absolutely free from blow holes; wrought iron or steel chaplets should never be allowed, and they must be finished smooth as this naturally reduces the surface exposed to attack.

Sulphuric acid readily absorbs moisture from the air when exposed; this locally dilutes the acid and causes excessive corrosion at the air-acid line in a tank. To overcome this difficulty all cast iron and steel acid tanks should be closed, or have an acid-resisting brick lining ring reaching from the top of the tank to below the acid level.

Steel.—Hydrochloric acid should not be brought in contact with steel. Strong nitric acid over 95 per cent. can be handled in steel vessels, but any diluting or heating causes a violent action. Weak sulphuric acid attacks steel more readily than cast iron, but steel resists fairly well down to 78 per cent. acid. Cast iron, however, should be used up to 95 per cent. sulphuric acid. Steel is quite safe for oleum and mixed sulphuric and nitric acids, especially for pressure vessels. The great difficulty with steel vessels is the joints, as rivets are very liable to leak. Welded steel tanks are, however, quite satisfactory.

Other Metals.—Another point is the importance of preventing contamination of the product as well as destruction of the plant. Zinc and aluminium are sometimes used for stills and cooling coils, as these metals give colourless salts with most acids. Very small quantities of an impurity in an otherwise harmless substance will often cause great trouble with corrosion; for instance, when evaporating a solution of zinc chloride, a little free hydrochloric acid is always formed, and this attacks the iron tubes. Another point to note is that dissimilar metals should not be in contact with each other and acid, as this condition tends to produce rapid corrosion.

Copper withstands weak sulphuric acid fairly well in the cold. The ordinary brasses are readily attacked by acids, but the bronzes, especially some phosphor bronzes, stand weak sulphuric acid almost as well as lead. Such parts as small cocks and centrifugal pump propellers are best made of phosphor bronze, if very weak acids have to be handled. Ammonia readily attacks copper.

Aluminium has many advantages over copper or brass, and is specially useful for plant-making drugs or foods, as its oxide is colourless and non-poisonous. Weak sulphuric acid up to 10 per cent. strength has very little action on absolutely pure aluminium, and this metal withstands strong nitric acid the best of all simple metals, but it must be pure and free from zinc and iron. All alkalis attack aluminium, and mixtures of sulphuric and nitric acid have more action than pure nitric acid. Aluminium is largely used for stills and other vessels for acetic acid; strong acetic acid has very little action, but weak acid causes local attack in the presence of air.

Tin stands oleum and ammonia very well, and is useful for making condensing coils where copper would be attacked.

Nickel is quite unattacked by alkalis, and is useful for steam valve seatings when an alkaline water is used. It is also useful for steam pipes used to heat up alkaline solutions. It is superior to copper in that it does not lose strength at high temperatures.

Antimony is the only simple metal that will resist cold and moderately hot hydrochloric acid. This acid is very difficult to handle, and is perhaps best provided for by ebonite lined or tarred wood vessels.

Acid-Resisting Iron Alloys

There are several well tried iron alloys on the market sold under patent names, such as Narki, Tantiron Duriron, Ironac, &c. These are all high silicon cast iron, containing from 14 to 18 per cent. silicon. They differ from ordinary cast iron in being a little lighter in density, weaker in tensile and crushing strength, extremely hard, very brittle, having twice to three times the shrinkage in casting, and are much higher in price. These properties give rise to several difficulties and limitations in their usefulness. Their extreme hardness makes them difficult, if not impossible, to machine; faces have to be ground and flanges made with cored bolt holes or slots. It is practically impossible to repair a broken casting. Their brittleness and lack of tensile strength necessitate special treatment in supporting pipes and towers made of sections of the alloys. Socket and spigot connections for pipes and tower sections are more satisfactory than flanges, and every vertical pipe or section should be individually supported at the back of the socket, or by means of a clip, and held independent of every other section, without the spigot of the section above resting on the bottom of the socket of the pipe below. Any suddee strain such as is caused by rapid heating will often product cracks. The shrinkage on casting is so great that large flan surfaces cannot be successfully cast. Pans must be designed with curved bottoms and domed covers. There must be no sharp corners on the castings; lugs and projections are liable to fracture by light knocks. The castings should be of uniform thickness throughout to avoid the unequal cooling, and must be provided with large openings for withdrawing the cores, and to act as core prints, as chaplets cannot be used. Single castings up to 10 cwts. with a maximum diameter or depth of 5 ft. is about the limit of size for satisfactory results, but, bearing the above limitations in mind, excellent results can be obtained by use of these alloys. Their high price is somewhat against their more general use; a straight pipe run for conveying nitric acid was found to cost seven times as much in special cast-iron alloy as in earthenware pipes. As regards their acid-resisting properties, they are practically unattacked by nitric acid of all strengths, hot or cold. Strong sulphuric acid does not attack them, and they can safely be used for all strengths of this acid above 65 per cent. up to the boiling point. They can also be used quite safely for cold sulphuric acid down to 35 per cent., weaker sulphuric acid has some action. Hydrochloric acid has most action, but far less than on ordinary cast iron; above 19 per cent. of silicon even hydrochloric acid has very little action.

Certain chrome-nickel steels have excellent acid-resisting properties; these are, however, expensive, and have not been much used or investigated so far in this country.

Certain special nickel, copper, chromium alloys also possess remarkable general acid-resisting properties, Some mixtures are very resistant to dilute hydrochloric acid, but work on these alloys appears to have been confined to America, and practical working tests are lacking in this country.

Proposed Empire Patent Law

Primary Advantages Outlined

RECENTLY in a Canadian magazine Mr. F. B. Fetherstonhaugh, K.C., set forth arguments in favour of a uniform patent law and a draft statute of a proposed British Empire Patents Act. Among the advantages claimed would be "the printing of patents concurrently in the Mother Country and in the several Dominions having patent offices, and the consequent spread of information as to industrial progress throughout the Empire; an examination as to novelty having been made in one of the parts of the Empire, no further examination would be required in any other part, thereby facilitating the speedy grant of a patent subsequent to the patent of origin, thus providing for the prompt introduction of an invention in each separate Colony or State; the cost to the different Governments maintaining their respective Patent Offices would be reduced to a minimum; uniformity in the laws and law procedure; uniformity of term of patent, trade mark, design, or copyright: uniformity in connection with the working of patents or manufacture of the invention under the patent. One of the main objects of such an Imperial Act, explains Mr. Fetherston, haugh, is to benefit the Empire by spreading throughout the Dominions or States thereof, continually, accurate knowledge of progress as it takes place in all parts of the King's Dominions, by means of printed publication of all letters patent granted for new and useful inventions, thereby serving to bring all the portions of the Empire into closer touch industrially and commercially through the arts and sciences."

Claims of the Fine Chemical Industry

MR. W. J. U. WOOLCOCK, M.P., general manager of the Association of British Chemical Manufacturers, in a letter to *The Times* states :—

"Before the war Britain did successfully manufacture for herself certain fine chemicals—quinine, morphine, chloroform, bismuth salts, iodides, and others. It was to Germany, however, that we, in common with the rest of the world, turned for our supply of salicylic acid, phenacetin, antipyrine, aspirin, and salvarsan, especially the latter. And why? Thanks chiefly to our own folly in allowing Germany to establish a world monopoly in the making of dyes; for many by-products of the dye industry are the raw materials from which synthetic drugs may profitably be made. What was practically one monopoly, therefore, in effect yielded a second, intrinsically valuable enough, potentially how tremendous an asset in war-time we know to our cost; for the one simple fact that many of the processes in the making of drugs are akin to those in the manufacture of explosives has by prolonging the war lost the world millions of pounds in money, and, worst still, the nations a toll in life not possible to replace.

"Industrial chemists and their attendant workmen cannot be trained in an afternoon; even if that were possible they would be unable to work without the essential plant and equipment. Germany had that plant; she had her experts and their workers already deft with the accumulated skill of years. She could and she did in a twinkling set her Chemist Reserve at work turning out not only drugs to keep in health her own population, but explosives to kill us others. Was there ever so sharp a judgment upon short-sightedness? Here were we with our chief source of medicines abruptly dammed. It is true that in our universities and colleges we did have a large number of able chemists; but their abilities were forced into an academic rather than an industrial bent. They did, indeed, tackle with a will the task that lay before them, first manufacturing drugs such as novocaine, as the home stock dwindled away; then mastering the technique which in time so efficiently kept our growing armies supplied with the queer needs of those terrible years. But, necessarily, it took time. New formulæ had to be worked out and new equipment had to be erected ere at last the thousands of experts working ceaselessly in their laboratories could see their first tiny experiments repeated in huge industrial plant upon the grand scale.

"The question for us to decide to-day is whether we are deliberately to throw away that experience of war-time which, fostered with foresight in those trying years, would yield us a flourishing new industry. It seems quite incredible that, having beaten Germany at her own game in war, we should quietly surrender to her again those monopolies from which she fashioned the machine that so nearly achieved our undoing. Go there or elsewhere they assuredly will, unless Parliament has the wisdom to set up machinery to control the stream of foreign drugs which is on the point of overwhelming our youngest industry. All that industry asks is, first, time to replace the temporary plant hastily installed during the war, and, secondly, some check upon a foreign exchange that reduces fair competition to a farce. Given these, it will in return dot Great Britain with factories which will not only in large measure renew our commercial prosperity, but at the same time, and, unlike the Army and Navy, without a penny of cost to the State, keep in training our Chemist Reserve for the nation's defence.

Petroleum Technologists

THE officers elected by the Institution of Petroleum Technologists for the session 1921-1922 are :—*President*—Professor J. S. S. Brame; *Past Presidents*—Sir Boverton Redwood, Professor Sir John Cadman, Sir Charles Greenway, and Sir Frederick W. Black; *Vice-Presidents*—Herbert Barringer, Sir George Beilby, Sir John Cargill, Viscount Cowdray, Arthur W. Eastlake, Sir Thomas H. Holland; *Council*—Alfred C. Adams, Herbert Allen, Major R. W. Barnett, M.P., Andrew Campbell, E. H. Cunningham Craig, Alexander Duckham, Dr. A. E. Dunstan, James Kewley, Dr. W. R. Ormandy, T. C. Palmer, Dr. F. Mollwo Perkin, Robert Redwood, John S. Smith, and Professor W. W. Watts.

Electrolytic Reduction of Glucose

Experiments by Findlay and Williams

AT a meeting of the Faraday Society on Tuesday week some notes on the electrolytic reduction of glucose were submitted by Professor A. Findlay and Mr. V. H. Williams.

The possibility of reducing glucose electrolytically, the authors pointed out, had attracted some attention in recent years, but the results obtained were somewhat conflicting. Thus, O'Brien Gunn stated that glucose dissolved in sulphuric acid of 1-3 per cent. concentration could be reduced electrolytically using graphite electrodes and a cell with a diaphragm, the current density at the cathode being 0·15 ampere per square decimetre. W. Loeb, on the other hand, failed to obtain satisfactory results, and was led to conclude that both the anodic and cathodic electrolysis of glucose led to an equilibrium between glucose, a pentose, formaldehyde, and lower carbohydrates, the cathodic reduction causing the equilibrium to shift in favour of the production of the lower compounds. As the reduction of glucose to the corresponding hexahydric alcohol was in itself a process of importance, it seemed worth while to investigate the electrolytic process more fully, and, more especially, to study the effect on the reduction of variation of the temperature, current density and current concentration. Although, as the result of their investigation, negative results, as regards the production of hexahydric alcohol, had been obtained, they desired to communicate some notes on their work which might prove of value in connexion with this problem.

The method and apparatus employed were essentially those used by Tafel in his studies on electrolytic reduction. A closed cell was employed as cathode chamber and the volume of hydrogen evolved during electrolysis was compared with that evolved from a hydrogen voltameter placed in series with the electrolytic cell. The difference in the volume of hydrogen evolved in the two cells represents the amount of hydrogen used up in the reduction. The glucose used was "extra pure" glucose supplied by British Drug Houses, Ltd. Examined polarimetrically it gave a rotation corresponding with a purity of 99·87 per cent. In most of the experiments lead electrodes were employed, and as Tafel had shown that the presence of metal impurities had a very unfavourable influence on the cathodic reduction, care was taken to ensure the purity of the lead electrodes employed. The purity of the lead was tested by analysis of the surface layers and the results of analysis were also confirmed by a repetition of Tafel's experiments on the reduction of caffein. This control served also to show that our method of working was satisfactory.

Some Results of the Experiments

During the progress of the experiments it was observed that the cathode solution, after electrolysis, possessed a sharp aldehydic odour, and the cathode was found to be coated with a film of slimy appearance. This film was soluble in alcohol. As it was thought that the production of this film might be the cause of the rapid falling off of the volume of hydrogen absorbed by the depolariser, experiments were carried out in which the same solution was subjected to repeated electrolysis, the cathode, after each run, being treated with boiling alcohol to remove the film produced. After each treatment of the cathode it was found that a further absorption of hydrogen took place, but that this absorption again rapidly fell off to zero. Using a current concentration of 0·444 amperes per 100 cubic cm., and a cathode solution of 20 per cent. glucose in 5 per cent. sulphuric acid, the following successive absorptions of hydrogen were realised: 28·5, 8·1, 32·2, 52·8, 30·2, 24·1 and 23·5 cubic cm. The total absorption amounted therefore to 199·4 cubic cm., or 40·1 per cent. of the theoretical amount. During these experiments, which extended over several hours, a considerable loss of glucose took place by diffusion from the cathode cell. In the most favourable case, where the highest current was employed, the loss amounted to nearly 30 per cent.; where lower currents were employed and the duration of the electrolysis was therefore greater, the loss by diffusion was, of course, also greater. Attempts to diminish diffusion by use of a membrane of copper ferrocyanide deposited in the wall of the porous cathode cell, were not successful.

Since the experiments seemed to indicate that a considerable proportion of the glucose had been reduced, an attempt was made to isolate the supposed product of reduction, the

hexahydrate alcohol. The solution was neutralised with chalk to remove sulphuric acid, and was then evaporated on the water bath. The syrupy liquid was dissolved in concentrated hydrochloric acid and the acid solution shaken with benzaldehyde and allowed to stand for several days. By this means, mannitol or sorbitol, if present, could be precipitated as a condensation product with benzaldehyde. No such compound, however, was obtained, and the authors were therefore driven to conclude that no appreciable amount of hexahydric alcohol was produced in their electrolytic experiments.

On examining the alcoholic washings from the cathode, a lead salt was isolated which, on analysis, was found to be lead formate. Formic acid was also found in the cathode solution after electrolysis. The production of this acid in the electrolytic reduction of glucose was mentioned by Loeb, who stated that glucose decomposed into formic acid and a pentose. The presence of pentose in the solution was detected by the furfuraldehyde test.

Further evidence of the production of formic acid was obtained from an analysis of the gas evolved at the cathode during electrolysis. This gas was found to be not pure hydrogen, but to contain about 4 per cent. of carbon monoxide, produced, presumably, by a deomposition of formic acid. The percentage of carbon monoxide varied somewhat during electrolysis, being greater during the earlier than during the later stages of the electrolysis. Although the destructive reduction of glucose with production of formic acid and a pentose did not appear to take place to a very large extent, the formation of these compounds might play an important part in the process of electrolytic reduction if, as seemed probable, it was the formic acid which led to the formation of the film on thecathode with consequent diminution or prevention of further reduction.

As a result of their experiments, which were in harmony with the results obtained by Loeb, the authors were forced to conclude that, contrary to the claims of O'Brien Gunn, no hexahydric alcohol is produced in the electrolytic reduction of glucose.

South Lancashire Chemical Industry

WIDNES and St. Helens (a correspondent writes) have long enjoyed the distinction of being the principal centres of the chemical industry in South Lancashire. The expansion of the works of the Castner-Kellner Alkali Co. Ltd. and of the Salt Union Ltd. at Weston Point made this locality a prosperous seat of the chemical and salt-making industry within a couple of miles of Widnes, yet outside of Lancashire. This newer Cheshire industry has for some years been able to confer benefit on other industries in the district, including some at Widnes, through the large supply of cheap electricity for power and lighting purposes, the Salt Union, Ltd., has been able to afford. At the recent inquiry by the Electricity Commissioners regarding the proposal to form a joint authority to supply electricity within Lancashire and Cheshire, Merseyside areas, it was elicited that the Mersey Power Co. had, in 1920, supplied 25,000,000 units of electricity for use at works in the vicinity, including works at Widnes; and that the average price charged had been less than 1d. per unit.

The United Alkali Co., Ltd., have just completed the erection and equipment of an electricity generating station on the West Bank, Widnes, by which it is hoped a full supply of electricity for the company's own uses, will be obtained at a cost of production not greater than that of the Mersey Power Co. In view of the policy of Corporations to put up the prices of gas and electricity the action of the Salt Union and the United Alkali Co. is not likely to be ignored, especially as the Salt Union's success in supplying electrical power was achieved by a simple utilisation of waste heat.

Patent Law and Chemical Research

Mr. Harold E. Potts writes: "Will you allow me to point out that short reports of these lectures may lead to misapprehensions in view of one or two misprints which have occurred. Further, it is difficult to give a short summary of a long lecture on an intricate subject, such as Chemical Patent Law."

Chemical Matters in Parliament

Anti-Dumping Bill

IN reply to a question by Mr. Asquith (House of Commons, March 23), Lord E. Talbot stated that the House would adjourn until Monday, April 4. On the following day, April 5, the business would include "Committee stage of Financial Resolution of the Key Industries Bill," and on April 6 "Report stage of Financial Resolution of the Key Industries Bill."

Major Nall: Does the term "Key Industries Bill" include anti-dumping legislation?

Lord E. Talbot: I have a shrewd suspicion that that is another name for it.

Sir W. Joynson-Hicks: Will the Bill be published before the Resolution?

Lord E. Talbot: It cannot be; the Bill is founded on the Resolution.

Artificial Manures

Mr. Gardiner (House of Commons, March 22) asked the Minister of Agriculture whether his attention had been drawn to the high prices being charged farmers for artificial manures; whether raw material used in the production of these manures was still controlled; and, if so, would he press for decontrol and use every endeavour to encourage the use of artificial manures when agricultural produce had fallen so seriuosly in value.

Replying, Sir R. Sanders said he was aware that the prices of artificial manures had risen considerably since the beginning of the war, but this was mainly due to the increased cost of production and transport. None of the raw materials used in the production of these manures had been controlled since 1919, and accordingly the last part of the question did not arise. Every endeavour was being made and would continue to be made by the Ministry to encourage the use of artificial manures by British farmers.

German Chemical Factories

Mr. Doyle (House of Commons, March 24) asked the Secretary of State for War, whether, in view of the public importance of what was known as the Hartley Report into the chemical plant of factories in that area of Germany visited by a Commission under General Hartley, he would agree to publish the Report as a White Paper at an early date; and if not, his reasons for doing so?

Sir L. Worthington Evans: The introduction to the Report of the British Mission appointed to visit enemy chemical factories in the occupied zone of Germany will be published as a Command Paper at an early date.

Key Industries Bill

Sir D. Maclean (House of Commons, March 24) asked the Joint Parliamentary Secretary to the Treasury whether he would circulate the terms of the Money Resolution which would be discussed on Tuesday week and which was the basis of the Anti-Dumping Bill?

Sir P. Lloyd-Greame said he thought it would be possible to get out the form of the Resolution in the course of the present week, and proposed to issue it as a Command Paper. He hoped it would be in the hands of hon. Members before the House met again.

Captain Wedgwood Benn asked if this Resolution was a draft, whether it would not have been possible to let them have it by March 29, in order that it might be fully considered before the Debate?

Sir P. Lloyd-Greame did not think that was possible. The right hon. member for Peebles suggested that it should be available by April 1, and he thought it would be possible to have it out by then.

In view of the promised early introduction of the KEY INDUSTRIES BILL, the hon. secretaries of the Commercial Committee of the House of Commons (Colonel Assheton Pownall and Mr. Carr) are asking members to communicate with them with regard to any point to which they wish to draw attention. A special meeting will probably be held to consider the Bill when the House reassembles.

Aluminium Welding Patents

Court of Appeal Judgment

On Tuesday in the Court of Appeal, the Master of the Rolls and Lords Justices Warrington and Younger delivered their reserved judgment in the case of Aktiengesellschaft Fur Autogene Aluminium Schweissung against the London Aluminium Co., Ltd., of London and Birmingham, upon the appeal by the defendants from a judgment of Lord Justice Sargant sitting in the Chancery Division. The action by the plaintiffs was for an injunction and other relief to restrain the alleged infringement of their letters patent Nos. 24,096 and 24,283 of 1907, granted to Max Ulrich Schorys for improvements in aluminium welding. The patents related to autogenous welding up of aluminium, the plaintiffs' case being that this was not absolutely novel at the date of the letters patent. They alleged infringement, by the supplying by the defendants, in January, 1918, to a Mr. A. Green of St. Albans of an aluminium lid welded to a saucepan of the same metal, and it was said, by the plaintiffs' patent process.

Defendants denied infringement and that the patents were invalid..

Mr. Justice Sargant held that infringement of both the patents had been established, and from this defendants appealed.

By a majority the Court of Appeal now dismissed the appeal with costs.

The Master of the Rolls said the plaintiffs' patents were for improvements in welding aluminium and improvements in welding or melting objects of aluminium. In the past difficulty had been experienced in welding and joining pieces of aluminium together, caused by the presence of oxides of aluminium on the surface of the metal. The plaintiffs claimed to have discovered a flux for this purpose. Fluxes had been used for welding and soldering other metals before the date of plaintiffs' patents, but had never been used for welding aluminium. His lordship referred to the alleged prior anticipations on which the defendants relied, and proceeding, said he thought the defence of want of novelty of subject matter failed. On the question of insufficiency, that defence was not seriously insisted upon either before Mr. Justice Sargant or that Court, and therefore he should say no more about it. After referring to the evidence in this part of the case, his lordship said he thought the plaintiffs' flux had a distinct effect upon oxides and contributed to successful welding. The conclusion he came to was that Mr. Justice Sargant's careful judgment was right on all points. It followed that in his opinion the appeal had failed.

Lord Justice Warrington concurred in this view. Lord Justice Younger delivered a dissenting judgment, holding that the weldibility of aluminium was known before the date of the plaintiffs' patent and that flux was then already known for soldering and welding that metal. For these reasons he held there was no subject matter in the plaintiffs' specifications and that both were invalid. He also held that the patents were invalid for want of utility. The appeal, in his opinion, should be allowed and the action dismissed.

Clouding of Lamp-Working Glass

Suggestions for its Elimination

At the March meeting of the Society of Glass Technology, held at the Neville Hall, Newcastle-on-Tyne, Dr. M. W. Travers submitted an interesting communication dealing with the technical reasons for the clouding of table-working glass when subjected to the action of a blow-pipe flame. He explained that a phenomenon often encountered in connexion with table-working glasses, whether of British or of foreign origin, was that an opalescent ring was formed during its heating in that section of the glass near the edge of the flame.

There were a number of distinct phenomena which bore upon the clouding of glass. The first of these was connected with a peculiar misty deposit which was often apparent on glass when it came from the annealing lehr. This cloudiness could sometimes be removed by allowing the glass to cool, and then rubbing it with a cloth. Secondly, there was an effect which was produced in certain pre-war German glasses. The commoner types of German table glass, if kept in stock for some time, particularly in the hotter climates, exhibited, upon being heated in a Bunsen flame, a surface opacity which was quite incapable of being removed in the manner described, and which was sometimes so pronounced as to cause the glass to break away in scales. Upon investigation it was found that this was due to absorption of moisture and CO_2. The fault was particularly noticeable in glasses which contained soda, lime and silica, or, in other words, very little alumina and no potash. He had tried recently to repeat this fault in British glass which had been kept for some time, but he had been unsuccessful. In one respect, therefore, it could be said that British glass was superior to the German-made glass.

Thirdly, there was that particular phenomenon with which he was now dealing specially, a fault which was common to all glasses, whether British or foreign—viz., an opalescent ring formed on that part of the glass covered by the outer edge of the flame in working. This particular ring could not be rubbed off with a cloth, and to that extent it was permanent. If the glass were allowed to stand in a covered box for a few days, the opalescent ring became more pronounced. The effect was intensified if one took a piece of the glass and drew it off in a Bunsen flame. When the glass was subjected to a pure hydrogen flame, there was no sign of opalescence, nor was there if a hydrogen flame were used and passed through CO_2. The obvious cause, therefore, was sulphur. By introducing sulphur into a hydrogen flame the opalescent ring was immediately achieved.

Summing up the results of a reasoned investigation, Dr. Travers expressed his conviction that the fault was due to the sulphur content of the gas employed exceeding a certain limit. He suggested that the prevalence of the trouble in table-glass working shops at the present moment was due to excess of sulphur content in the gas, due to the removal of the restrictions which formerly controlled gas-manufacturing practice.

Pure Chemistry

The Dangers of Specialisation

At the annual general meeting of the Chemical Society, held at Burlington House on March 17, the following new officers and members of the council were elected: President: Sir James Walker; Vice-Presidents: Professor H. E. Armstrong, Sir James J. Dobbie, Professor W. H. Perkin, Sir W. J. Pope, Dr. Alexander Scott, Sir William Tilden, Professor F. G. Hopkins, Professor F. S. Kipping and Professor J. F. Thorpe; Members of Council: Professor J. S. S. Brame, Dr. C. H. Desch, Mr. E. V. Evans, Mr. H. B. Hartley, Dr. T. S. Patterson, Dr. T. Slater Price, Mr. W. Rintoul, Dr. R. Robinson and Dr. N. V. Sidgwick.

In presenting the Longstaff Medal to Professor J. F. Thorpe, the President referred to his contributions, over a period of twenty-five years to organic chemistry, his experimental skill and scientific insight.

Sir James Dobbie, the retiring President, presented his address on "The History of Chemistry," in which he drew attention to the fact that one result of the war had been the fostering of the applications of science to industry, thereby fostering the lessons of war in peace. Recalling a statement by Roscoe, to the effect that there was no point published in the "Transactions" of the Society which might not some day prove applicable to industry, Sir James said he was convinced that the empiricism which had lingered in our industry was giving way to a new era.

Alluding to the dangers consequent upon too great a specialisation in chemistry, Sir James said he thought that the growth of the technological institutes presented a danger to pure science. Manufacturers had come to the conclusion that the chemist with a solid foundation of pure scientific chemistry was of more use to them than the specialised technologist.

As there was no finality in theories there was a necessity for hypotheses and theories in chemistry. The differences which arose between Dumas and Berzelius with regard to atomic weights was due to the non-application of Avogadro's law; Lavoisier's investigations revolutionised the conception of the day on combustion, and thus each theory built upon some observation represented a further step forward, and imparted a lesson to keep the mind open.

Calcium Sulphate Cement

Effect of Some Physical Conditions

On March 23 Professor P. P. Bedson presided over a general meeting of the Newcastle-upon-Tyne Section of the Society of Chemical Industry, when Mr. C. L. Haddon read a paper on "The Effect of some Physical Conditions on Calcium Sulphate" and Mr. Tidman one on "Alcohol from Coke-Oven Gas." (*See* THE CHEMICAL AGE, March 19, page 331.)

Mr. Haddon said that anhydrous calcium sulphate cement bore a number of different names, such as flooring plaster, estrich gyps and dead burnt plaster, with a slightly modified form known as Keene's cement. The actual setting time of flooring plaster depended on the temperature and duration of heating used in its manufacture, but subsequent conditions had the same comparative effect on different samples of plaster. It had been shown long ago that when flooring plaster set it was through the anhydrous salt dissolving and being precipitated as crystals of the less soluble dihydrate. Those crystals in dilute solutions were seen to form radiating bundles of needles, and it was assumed that it occurred in its use as a cement and that fracture of the cement was caused by the breaking of the interlocking crystals. He described the theories of Davis on the point and added that data as to the superficial expansion, which was the most important from the practical point of view, was lacking. He described his experiments in measuring expansion, using Le Chatelier's apparatus. The same flooring plaster was used throughout the experiments.

Factors Effecting Expansion

Three parts by weight of plaster were mixed with one part of water or solution and placed in the cylinder. The expansion was measured at different times. The first table showed that the expansion was least when accelerating solutions were used and greatest when retarders were used; that wet set plaster, using a 5 per cent. solution of a sulphate as an accelerator, although reaching its maximum strength within 24 hours, yet continued to expand during recrystalisation; that wetness had a great effect on tensile strength. With plaster kept weakened in that way a much greater expansion resulted—the degree of wetness affecting expansion; that expansion under normal conditions was very small, about 1 per cent., and ceased within seven days—the time for complete setting or drying. No attempt was made to measure expansion while the cement was still plastic. The cause of the expansion was obvious, being due to the pushing apart of the mass by crystals as they formed. An expansion of 5 per cent. could easily be produced by using a retarder and keeping the cement wet.

The amount of expansion had an effect on the tensile strength. Briquettes which had expanded 5 per cent. had less than a quarter of the strength of similarly made briquettes allowed to dry in the air when the expansion was very much less. Similarly, in test pieces, where the plaster was placed in water six hours after making the briquette and the briquette broken after seven days when still wet, the tensile strength averaged 200 lb. per square inch, while, when the briquette was allowed to dry in the air and placed in water only for the seventh day, the average tensile strength was 250 lb. per square inch.

When the weakening of flooring plaster by wetness was first mentioned in a previous paper, Mr. Hoare Collins had suggested that it was due to the lubricating action of the water. For purposes of investigation, test pieces were made, placed in water after six hours, taken out after 14 days, and left in a warm dry room till they ceased to lose weight. Briquettes were then immersed in different liquids for definite periods and then broken. The second table of results showed that the mineral oil had no effect on strength, whilst with alcohol and water mixtures the loss in strength was dependent upon their proportions. Water halved the tensile strength, as did a concentrated solution of calcium sulphate. Leaving in water for 10 minutes, provided that the whole cross-section of the cement was wetted by capillary action, had the same effect, showing that it was not due to the solubility of the set cement in water. The small amount of water necessary was shown by the fact that if one end of the test piece was placed in water, the water, creeping up through capillary action, had the same weakening effect. The same result was obtained with crushing strength being reduced from about 2 tons per square inch to half that amount. There was no accepted explanation of lubrication. Southcombe's suggestion that it was due to the interfacial tension between oil and solid could not be confirmed because the tension could not be measured.

It seemed curious that oil should not act as a lubricant whilst water did. Oil certainly acted as a lubricant when one slab of set flooring plaster was rubbed over another. In metals the crystals were supposed to be covered with some amorphous intercrystalline cement, stronger than the crystal, which broke in cases of fracture. It was possible that some such amorphous calcium sulphate dihydrate existed and that was affected by free water. It could only be said that with our present knowledge of physical phenomena a full explanation was impossible.

Cementing Power

The cementing power of calcium sulphate cement might be described as follows: Crystals of the dihydrate grew in the form of needles until there was a great frictional resistance to disruption and interlocking. Breaking was largely, if not entirely, due to that frictional resistance being overcome and not to the breaking of the crystals themselves as was the case with metals.

The value of all published data of the mechanical strength of flooring plaster was impaired by the fact that no standard had been laid down as to the condition of the briquette on breaking. The popular way appeared to be to keep the briquette in a more or less damp room during setting. The effect of different amounts of free water would considerably vitiate the results. The fairest way was to do precisely as was done with Portland cement, *i.e.*, leave the briquettes in the moulds for 24 hours, take them out and place them in water, and then break the wet briquettes after a week. That would give comparable results regarding the effect of expansion, eliminating error regarding wetness. The proportion of flooring plaster to water by weight should be three to one, as that gave a plastic mass of uniform composition, while deviations in those proportions gave cements of different strengths.

Chemical Trade Marks

Rights in Specific Names

JUDGMENT was given recently in the Scottish Court of Session in a reclaiming note, in which George Walker & Sons, Ltd., manufacturing chemists, of Glasgow, brought under review an interlocutor of Lord Hunter refusing to grant interdict against Robert Kego, manufacturing chemist, of Rutherglen, and his wife, from in any way advertising or selling any chemical or medicinal goods under certain specified names.

Until November, 1919, Robert Kego was the complainers' manager. The complainers ascertained that after that date Robert Kego had procured the registration as trade marks in his own name of various names of medicinal goods, which names had been suggested by him while in the complainers' employment, and had been approved by the directors of the complainers' company as names for preparations to be manufactured and sold by the complainers. The complainers accordingly raised an action to have it declared that the trade marks were their property, and Lord Blackburn in May last found in their favour, and directed that the entries should be expunged from the register of trade marks. That interlocutor was not reclaimed, and therefore became final.

In the present action the complainers said that in March, 1920, the respondents, under the name of the Eusaline Company, issued to chemists and others, including the complainers' customers, a circular in which they solicited orders for preparations bearing names registered as trade marks dealt with by Lord Blackburn, and they asked interdict. The respondents explained that the recipes from which the various substances were prepared were invented by Robert Kego, who, they alleged, alone knew the recipes and never communicated them to the complainers.

In the Outer House (*see* THE CHEMICAL AGE, January 15, page 74), Lord Hunter recalled the interim interdict which had been granted, refused the note, and found the respondents entitled to expenses.

The Court restored the interlocutor of Lord Hunter, restored the interim verdict and sisted the case until the matter had been disposed of by the Registrar of Trade Marks.

The Consumer's Fourteen Points

By Ernest J. P. Benn

WE, of this generation, have an advantage over our forbears in that we have lived through a period during which two distinct and opposite economic systems have been at work. Most of us have been aware, especially during the war, that there was a change in the order of things, but few of us have realised the fundamental economic character of that change. We have noticed that, whereas before the war the buyer was in command of most markets, the position has altered, and the buyer in many cases has been reduced to the level of a suppliant. The war period with its shortage is now rapidly passing from us, and it is important that before it disappears entirely we should note some of its leading characteristics, and learn anything they have to teach us from the industrial or economic point of view. Prior to the war the consumer was the monarch of all he surveyed; every industry was in a condition of slavery to his wishes. Trade was brisk, employment good, the standard of comfort constantly improving, the rate of progress getting faster and faster, all at the bidding of the consumer, to whom everybody in commerce and industry bowed as the supreme authority.

But the war altered all that, and for the last seven years the old power of the consumer has gone. He has been reduced to subjection, and has submitted to the indignities of innumerable forms of registration, coupons, rationing, priority, price-fixing and all the rest of it. So long as these inconveniences were put upon him in the name of the war he had no just cause to complain, but since the war has ended, and since many of these things still continue, he is beginning very properly to question their necessity. As the various Government departments loosen their strangling hold upon the markets trade unions and trade associations are gradually tightening their grip, and it is doubtful whether the consumer, on the whole, is very much better off under the rule of the organised producers than he was under the rule of the autocratic controllers. The favourite occupation of both these sets of masters is price-fixing; both of them have assumed that they are entitled to dictate to the consumer the price at which he shall enjoy the goods and services which they are prepared to offer him.

It is, however, one thing to fix the price which the consumer shall pay, and quite another to persuade him to put his hand in his pocket and bring out the money. Producers have hitherto been the slaves of the consumers; indeed, the trade-union section of the producers is fond of talking about wage-slavery; but producers as a whole, both trade unionists and employers, are now engaged by means of all sorts of restrictive organisation in an endeavour to rid themselves of the mastery of the consumer, and to reach a position in which they can dictate to him the terms upon which his requirements shall be satisfied. It is this attitude of mind, this policy, permeating as it does the actions of all parties to industry, which is chiefly responsible for the stagnation and the difficulties with which we are faced to-day.

There can be no doubt that we in industry are faced with the most powerful movement ever known, the consumers' strike. This great force is all the more dangerous because it is unorganised. No attempt has been made by any party to promote it; no special pleading has been needed to give it enthusiasm; it is under no control; it has no leaders; it springs from that sense of right which is within the bosoms of all individuals, and it will not abate until the offence to that sense has been removed. It is at least open to question whether some good might not be done by an attempt to focus the consumer's point of view, and bring it home to the minds of those who imagine that by sectional organisation they can alter the economic foundations of industry. If the consumers' strike had at its service a publicity department such as that which serves most of the trade unions, or our modern Ministries, a manifesto would be issued on something like the following lines:—

Our Fourteen Points

(1) That politics have nothing to do with industry.
(2) That an article is worth what it will fetch.
(3) That Capital and Labour are both profiteering at the expense of the consumer.
(4) We deny the right of anybody to enjoy a degree of comfort out of proportion to the service which he renders to the rest of society.
(5) We believe in high wages for honest and efficient work.
(6) Any system of wages which disregards production is an imposition upon us.
(7) The development of a high sense of individual responsibility is the only way to secure economy and comfort for all.
(8) That restrictions upon output or prices or markets are against the best interests of all.
(9) That the present public expenditure at the rate of over five millions per day is an outrage, and has the effect of adding considerably to the cost of all commodities.
(10) That the maintenance of two and a half million officials and public servants is an intolerable burden upon the consumer.
(11) That the interests of the whole community are more important than those of any section.
(12) That the consumers are the whole community and are, therefore, entitled to override the convenience or views of any class or faction.
(13) While we understand the objections to what is termed "wage-slavery," we see no advantage in a system of freedom for producers which places consumers in the chains of bondage.
(14) That the only freedom which all can enjoy is freedom as consumers, and that the public interest is best served by safeguarding that freedom, and by the prohibition of any arrangements, whether by Government departments, trade unions, or trade associations which tend to limit it.

Some of these views sound very old fashioned in these days when a curious mixture of protective Socialism is the most fashionable industrial receipt; but, they are the views which are held by the most rabid price-fixing bureaucrat or wage-raising trade unionist so soon as he leaves his work and becomes consumer; they are the views which, deep down in the breast of everybody, are operating to restrict demand and are bringing trouble upon industry. The recognition of them, which is now gradually coming back to us, will lead us to a wider view of our functions, either as employers or employed, and hasten the day when we shall both find ample and remunerative work in the service of consumers, who are as anxious as ever to employ us if only we will put ourselves into proper relations with them.

Electrician Directory and Handbook

THE thirty-ninth edition of the "Electrician" Electrical Trades' Directory and Handbook, commonly known in the electrical industry as the "Big Blue Book," is now available, and its contents have undergone careful revision. In the Handbook Section there is much technical, commercial, legal, and other information relating to the various branches of the electrical industry, but we have only space to mention a few of the leading features. These include a number of electro-technical tables and data, particulars of resistance materials, electricity, supply cables, fuse tables, wire gauges, aluminium data, notes on illumination, electric lighting and power on U.K. railways, railway telegraphs and block signalling, the periods allowed for repayment of municipal loans for electricity supply and electric tramways, interest and sinking fund tables, &c., particulars of work of British Engineering Standards Association, the International Electrical Commission, International Symbols, the Imperial Ohm Ampere and Volt, the Standardisation Rules of the British Electrical and Allied Manufacturers' Association, details of the Import Duties leviable on electrical machinery, apparatus and material in the Biritish Dominions and Colonies and in Foreign Countries, lists of trade commissioners and commercial correspondents abroad, &c. In the British alphabetical division of the directory are included the names, descriptions, and addresses of everyone engaged or connected with the electrical and allied trades, while the classified section contains full lists of the firms and persons engaged in the manufacture or supply of electrical plant and apparatus.

From Week to Week

There were 10 FATAL ACCIDENTS in the chemical trade during February.

Four cases of PITCH POISONING were reported for the month of February.

EXPORTS OF PHOSPHATES from North Africa during 1920 totalled 1,870,589 tons.

A correspondent writes that numerous inquiries have been received in Leeds of late for PRUSSIATE OF POTASH.

Field Marshal Sir William Robertson, Sir William Alexander and Mr. Vernon Clay have joined the board of the BRITISH DYESTUFFS CORPORATION, LTD.

The late Dr. J. C. CAIN directed in his will that "all necessary steps be taken to ascertain that he was dead, and not in a state having the semblance of death."

THE DEATH occurred at Baillieston, on March 22, of Mrs. Clibborn, wife of Mr. J. W. Clibborn, works manager at the United Alkali Company's St. Rollox Works.

Sir Edward Thorpe, Professor Le Chatelier, Professor Ciamician, and Dr. Ernest Salvay have been elected honorary foreign members of the CHEMISTS' CLUB, NEW YORK.

The second paper published by the FUEL RESEARCH BOARD is a "Report on the Simmance Total Heat Recording Calorimeter." The joint authors are Dr. T. Gray and Mr. A. Blackie.

It is reported that with suitable labour the seventeen pits of the POTASH MINES IN THE MULHOUSE BASIN can produce 4,000,000 tons of sylvinite and 7,000,000 tons of pine potash in four years.

HARRISONS & CROSFIELD, LTD., have been appointed secretaries to the Strathisla (Perak) Rubber Estates, Ltd., and the registered office of the Company has been transferred to 1-4, Great Tower Street, E.C.3.

The Home Secretary has appointed Sir Beville Stanier, Bt., M.P., to be an additional member of the Committee appointed to consider the outstanding objections to the Draft Regulations under the DANGEROUS DRUGS ACT.

A CARGO of 172,000 gallons of oil from Abadan, Persia, arrived at Swansea this week. The oil was pumped through pipes to large tanks on the dock of the Anglo-Persian Oil Co. at the rate of 16,000 gallons an hour.

An Agencia Americana wire from Santiago, Chile, states that the Government has authorised its Minister in Berlin to discuss with the German Government the IMPORTATION OF CHILEAN NITRATES TO GERMANY.

A NET PROFIT of £42,818 has been realised for the State by National Waste Products, the Government Corporation formed by the National Salvage Council, which was set up by Lord Inverforth. The Corporation produced large quantities of glycerine, fats, fertilisers, &c.

According to the *Labour Gazette*, the number of WORKERS IN THE CHEMICAL AND AMMUNITION TRADES registered as unemployed on February 25 was 23,830, an increase of 5,533 on the previous month. There were 9,050 workers on short time, as compared with 5,027 on January 28.

An official telegram received by the High Commissioner for New Zealand states that a big demand is anticipated for the 70,000 TONS OF PHOSPHATES from the ex-German island of Nauru, which are likely to be available in New Zealand this year. The first ship-load is expected shortly.

Captain E. T. STERNE, who made many friends during his recent business visit to London as the representative of Shawinigan Electro products, Ltd., has returned to Canada and is now associated with G. F. Sterne & Sons, manufacturers of asbestos cements, plastic firebrick and high-temperature cements at Brantford Ontario. He also represents A. Boake Roberts & Co. Ltd. of London.

The Commercial Secretary to His Majesty's Legation, Belgrade, reports that a company in Zagreb require a quantity of creosote for the impregnation of approximately one million beech railway sleepers. From four to twelve kilos of creosote are stated to be required for each sleeper. The name and address of the company referred to may be obtained by United Kingdom firms interested, on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

Concerned by the dangers attending the APPLICATION OF RADIUM, the French Academy of Medicine on Wednesday, appointed a committee to frame a list of precautionary measures. The committee will include Drs. Béclere, Delbet, Siredey, Broca, Quénu and Martin. The decision followed the reading of a paper by Professor Bordier, of Lyons University, who declared that the dangers incurred by those manipulating radium were far greater than those faced by X-ray operators.

In his report on the INDUSTRIAL SITUATION IN ROUMANIA at the end of 1920, the Director-General of the Department of Industry and Commerce at Bucharest states that the present production of the chemical industry is about 40 per cent. of normal. This depression is attributed to the need for renewing installations destroyed or depreciated during the war, lack of markets for such products as calcium carbide, soda calcinate, and hyper-chloride of calcium, and the impossibility of exporting in competition with foreign manufacturers.

MR. REGINALD JOSIAH SARJENT, M.Sc., research chemist with Hadfields, Ltd., Sheffield, and formerly with Bolckow, Vaughan & Co., Middlesbrough, has been recommended by the Bradford Technical Education Committee to be appointed Lecturer in Metallurgy at the Bradford Technical College. Mr. Sarjent graduated with Honours in chemistry at London University and studied at the Imperial College of Science and Technology from 1913 to 1918, being research assistant in the department of Chemical Technology at that institution for two years. He has contributed papers in the Proceedings of the Royal Society in conjunction with Professor Bone, and in the Iron & Steel Institute's *Journal*. He is a specialist on the heat treatment of steel.

NEXT WEDNESDAY the Faraday Society, the Institution of Mechanical Engineers, the Iron and Steel Institute, the Institute of Metals, the North-East Coast Institution of Engineers and Shipbuilders, the West of Scotland Iron and Steel Institute, and the Institution of Engineers and Shipbuilders in Scotland, will hold a joint general discussion at the Institution of Mechanical Engineers, Storey's Gate, S.W.1, on the "Failure of Metals under Internal and Prolonged Stress." Papers will be submitted by Dr. W. Rosenhain, Professor C. H. Desch, Dr. W. H. Hatfield, L. Archbutt, J. C. W. Humfrey, R. H. N. Vandresy and W. E. Ballard, R. W. Woodward, Dr. F. Rogers, Sir Henry Fowler, D. Hanson, J. A. Jones, H. S. Rawdon, H. Moore and S. Beckinsdale, O. W. Ellis, W. C. Hothersall and J. Arnott.

The Action of Guanol

REFERRING to researches on the action of guanol, a fertiliser obtained by methodic fermentation of peat bathed with vinasse from distillation of beet molasses, under the action of micro organisms, which produce ammonification of the nitrogenous elements (especially betain), *Chimie et Industrie* states that the product is then dried; it contains 3.5 per cent. nitrogen, and 7 to 8 per cent. potash. Results of experiments demonstrate that (1) the effects of guanol are very slight in pots, being about equal to the percentage of nitrogen in the fertiliser; (2) In the case of potatoes, in a clay soil, 6 parts of guanol gave an increase of 28.7 in the crop; (3) There was no favourable effect with beet in heavy clay soil. Thus the action of guanol is not clearly specified, and further research is necessary.

Price of Fertilisers

AT a meeting of the Forfarshire Agricultural Executive Committee held on Monday, Mr. W. C. Moyes, president of the Forfarshire branch of the Farmers' Union, said that the prices for fertilisers were fixed at extravagent rates at a time before the harvest, when it was expected that the prices for grain would continue to be high. The grain prices had continued to fall lower, but the fertilisers were still kept at a high standard. A manure agent had informed him that but for the Board of Agriculture they could sell sulphate of ammonia at £15 per ton instead of the present price of £24 per ton. He considered the committee should protest, and call upon the Board to get rid of the control right away.

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Patent Literature

Abstracts of Complete Specifications

159,246. Bituminous Coal, Brown Coal and Shale, Process and Apparatus for Distilling by Superheated Steam. M. Gercke, 22, Lindenstrasse, Nürnberg, Germany. Application date, October 20, 1919.

The raw bituminous material is preheated before being subjected to the action of the superheated steam. The material is delivered from a hopper to the lower end of the upwardly moving part of an inclined, endless conveyor. The conveyor consists of articulated members carrying pistons and the material is carried upwards through a steam-jacketed cylinder where it is preheated. The material then passes through another steam-jacketed cylinder surrounded by steam superheated to 500°C. which also passes through the perforated wall into the material. The solid residue is discharged at the upper end. The liquid by-products and water of condensation collect in the bottom of the steam jacket, and the gas passes off with the steam. In a modification the raw material is first passed through a bath of hot heavy anthracene oil which expels water and some volatile constituents. The oil is driven off in subsequent distillation and may be fractionally condensed and used again.

159,261. Purifiers, Condensers and the like, Means for Reversing the Flow of Gas in. Firth, Blakeley, Sons & Co., Ltd., 15, Park Row, Leeds, and W. Blakeley, Beechwood, Church Fenton, near Leeds. Application date, November 15, 1919.

Two valve boxes are provided on the front of the purifier and are connected with the gas inlet and outlet pipes respectively. The inner side of each box has two openings communicating with two vertical conduits within the purifier, one having an opening at the top and the other at the bottom. The two openings in the valve box which communicate with these conduits are controlled by a pair of valves carried by a lever pivoted so that when one is open the other is closed. These levers are operated simultaneously by means outside the valve boxes.

159,285. Coal, Treatment of Materials Containing. E. Edser, 3, Hillyfields Crescent, Brockley, London, S.E.4, H. L. Sulman, 44, London Wall, London, E.C.2, and F. B. Jones, 62, London Wall, London, E.C.2. Application date, November 20, 1919.

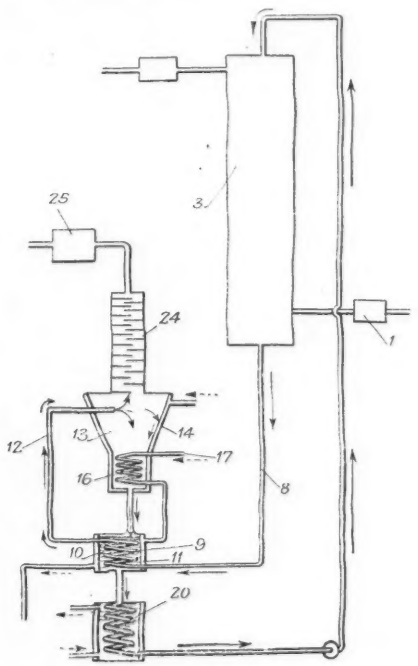
Coal is recovered from refuse, shale and the like by a froth flotation process. The finely powdered material is suspended in water containing a modifying agent such as silicic acid sol, sodium silicate, sodium carbonate, caustic soda or other alkali, or aqueous solution of an inorganic salt, such as sea water. The contamination of the coal-bearing froth with particles of gangue is thereby avoided. If it is desired to separate coal only, a small proportion of a frothing agent such as cresol, creosote, wood or coal tar, which is substantially soluble in water, may also be added. If a small proportion of an insoluble agent such as paraffin oil is also added, carbonaceous shale is also separated. Other frothing agents also mentioned are infusions of saponin, cinchona, or quassia.

159,314. Mineral Classifying and Concentrating Apparatus, Construction of Trommel for. W. W. Richardson, 4, London Wall Buildings, London, E.C.2. Application date, November 24, 1919.

A trommel for mineral classifying and concentrating apparatus consists of a series of short cylinders connected together end to end, every alternate cylinder being of slightly smaller diameter and arranged eccentrically to the other cylinders which are all concentric. The intermediate eccentric drums are arranged so that the successive drums have their eccentric centres spaced at equal intervals round the centre line of the concentric larger drums, so that these centres lie in a helical line. Each cylinder is formed of or lined with riffle plates having circumferential grooves with recesses or pockets formed in the base of the grooves at intervals around the circumference.

159,337. Liquid Sulphurous Acid from Dilute Sulphurous Acid Gas, Process and Apparatus for the Manufacture of. P. Pascal, 117, Boulevard Haussmann, Paris. Application date, December 2, 1919.

The process is for treating diluted sulphur dioxide, *e.g.*, the gas derived from pyrites-roasting furnaces, and is based on the absorption of sulphur dioxide by carbolic oil distilled from coal tar at a temperature range of 175-225°C. and having a density of about 1. The dilute gas from a compressor 1 is passed into the bottom of an absorption tower 3 filled with packing material over which coal-tar oil trickles downwards and absorbs the sulphur dioxide. The sulphurous acid solution passes through the pipe 8 to the worm 9 in a tank 10 which is surrounded by a steam jacket 11. The liquid is then ejected from the nozzle 12 tangentially into a conical separator



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13 having a steam jacket 14, and the solution collects at the bottom, where it is heated by a worm 16 traversed by steam from the pipe 17 which then passes into the jacket 11. Gas is liberated from the solution in the separator and passes upwards through a plate column 24 which separates any oil and returns it to the separator, while the pure sulphur dioxide passes on to the suction pump 25. The hot oil from the bottom of the separator passes through the heat exchanger 10 where it heats the incoming liquid, and then passes through a water-cooled coil 20 to the pump 4 to be used again.

159,380. Magnetic or Weakly Magnetic Iron Ore Containing Magnetic Ferrous Sulphide as a Secondary Constituent, Process and Apparatus for Treating. R. Stören, Kongsberg, Norway, and R. Johanson, Odda, Norway. Application date, December 18, 1919.

The process is for treating iron ores to remove pyrrhotite (magnetic ferrous sulphide) from the oxide constituents. The ore is heated at about 500°C. in a current of hydrogen which partly reduces the oxide content and renders the sulphide content permanently non-magnetic. The material is then suspended in water on leaving the reduction furnace, and the wet material is treated in a magnetic separator and the oxide conveyed to another reduction furnace for conversion into the metal.

International Specifications not yet Accepted

156,777. FIBROUS CELLULOSE. C. Harnist, Hotel Belle Vue, Berlin. International Convention date, July 6, 1914.

Raw cellulosic material is treated with steam with or without alkaline or organic solvents to remove tannin, resins, &c., and then in succession with ammonia gas and sulphur dioxide under pressure. The lye is neutralised or made alkaline, mixed with catalysts such as thionates, polythionates, or thiosulphates, and then treated with hot waste gas from sulphur or pyrites furnaces in towers. Sulphur dioxide, ammonia, and alcohol are thus eliminated, and the liquor may be used as a fertiliser, with or without potash salts, or it may be subjected to alcoholic fermentation.

156,799. NITROUS GASES. Norsk Hydro-Elektrisk Kvaelstofaktieselskab, 7, Solligaten, Christiania. International Convention date, October 6, 1915.

Gases containing lower oxides of nitrogen are treated with sulphuric acid of 90-91 per cent. strength which absorbs the oxides. The nitrosyl-sulphuric acid is then passed downwards through a dephlegmation apparatus to liberate the nitrous gases in concentrated form, and the sulphuric acid is used again. The oxides of nitrogen are treated with air and water to produce 67 per cent. nitric acid.

156,800. NITRIC ACID. Norsk Hydro-Elektrisk Kvaelstofaktieselskab, 7, Solligaten, Christiania. International Convention date, May 22, 1915.

Nitrous gases are absorbed in strong sulphuric acid and the solution is passed downwards through a tower in countercurrent to air and the vapour from dilute nitric acid. Nitrous gases and nitric acid vapour are liberated and the former are condensed in water and used for treating a further quantity of nitrosyl-sulphuric acid. The nitric acid vapour is condensed to fuming nitric acid.

157,047. FORMALDEHYDE AND METHYL ALCOHOL. H. Dreyfus, 69, Schutzenmattstrasse, Basle, Switzerland. International Convention date, March 22, 1917.

Carbon monoxide or dioxide is hydrogenated by the aid of a catalyst of platinum black or nickel which may be supported on pumice. The platinum black may be produced by reducing chloroplatinates with formaldehyde and precipitating with alkali and the nickel by precipitating the nitrate with alkali and reducing at a temperature below 100°C. Formaldehyde or/and methyl alcohol are obtained by the hydrogenation.

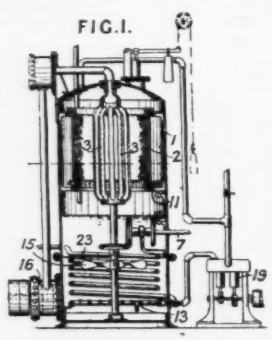
157,048. ETHYL ALCOHOL. H. Dreyfus, 69, Schutzenmattstrasse, Basle, Switzerland. International Convention date, March 22, 1917.

Liquid aldehyde is hydrogenated to alcohol by the use of a catalyst prepared as above. The catalyst may be supported on pumice, or a nickel nitrate solution may be mixed with sodium silicate and evaporated to dryness.

157,050. VULCANIZING RUBBER. Soc. R. Allenet et Cie, Distilleries des Deux-Sevres, Melle, Deux-Sevres, France. International Convention date, January 15, 1920.

The vulcanisation of rubber is accelerated by the addition of furfuramide, condensation products of pyromucic aldehyde with ammonia or amines, or other nitrogen derivatives of furfuryl.

FIG.I.



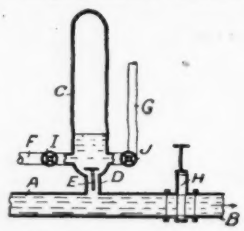
157 057

157,057. HYDROGENATING OILS. Y. Fujimura, 75, Fourth Street, Aoyama Kitamachi, Akasakaku, Tokyo, and Naigai Shintaku Shoji Kabushiki Kaisha, 45, Third Street, Higashiku, Osaka, Japan. International Convention date, January 12, 1920.

The mixture of fatty oil and catalyst is drawn from the bottom of the reaction vessel 1 by a pump, 16, and forced into a device, 3, consisting of a number of tubes with peripheral apertures, by which it is sprayed on to a screen of active nickel gauze, 2. The sprayer 3 and gauze 2 rotate in opposite directions. The hydrogen is circulated by a pump, 19, which draws it from the top of the vessel 1 and returns it at the bottom through nozzles 13, so as to set the oil in rotation. A paddle, 15, produces an intimate mixture of the oil and hydrogen, and the mixture is heated by a coil, 23.

157,152. GASEOUS REACTIONS UNDER PRESSURE. K. A. F. Hiorth, Askir, near Christiania. International Convention date, July 2, 1915.

High pressure reactions, such as the synthesis of ammonia, are effected in a valveless reaction chamber. The reaction gases are admitted to the vessel *C* through the pipe *F* and valve *I*, while under some pressure. Liquid flowing through the pipe *AB* is suddenly checked by the valve *H*, so that a high instantaneous pressure is produced by inertia, and the gas is compressed in the vessel *C*. Liquid rises above the valves *I*, *J*, and the non-return valve *E* closes. The products are withdrawn through the valve *J* and pipe *G*.



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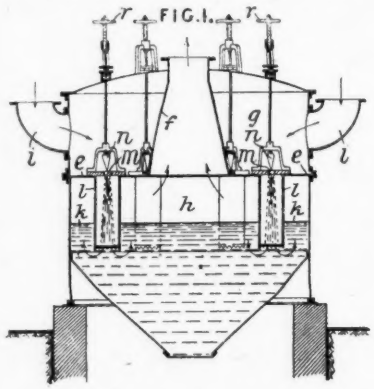
157,223. SATURATORS. C. Still, Recklinghausen, Westphalia, Germany. International Convention date, August 8, 1919.

The apparatus is more particularly for the production of ammonium sulphate. Gas is admitted by two diametrically

FIG.I.



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opposite ports, *i*, and passes into a number of vertical pipes, *l*, arranged in a circle, by means of constricted openings, *m*, controlled by valves *n*, operated by hand wheels, *r*. The gas passes under the serrated lower ends of the pipes into the liquid, and unabsorbed gas passes off through the funnel *f*.

157,226. AUROTHIOSALICYLIC ACID. Farbwerke vorm. Meister, Lucius & Bruning Hoechst-on-Main, Germany. International Convention date, October 13, 1915.

Ethyl acetate solutions of thiosalicylic acid and a gold double halide, such as potassium aurobromide, are mixed and then filtered and absolute alchohol is added. Aurothiosalicylic acid ($AuS.C_6H_4.COOH$) is precipitated.

157,227. CAMPHYLCARBINOL. H. Rupe, Basle, Switzerland. International Convention date, June 2, 1916.

A solution of oxymethylenecamphor in alcohol or acetic acid is reduced by hydrogen with a finely divided nickel or cobalt catalyst to produce camphylcarbinol.

157,253. HALOGEN HYDROCARBONS. I. Pfeifer, Hamburg, Germany, and N. Mauthner, Buda Pest. International Convention date, November 20, 1918.

A mixture of hydrocarbon and halogen with a catalyst such as iron, copper or antimony or their salts is allowed to react at 150°C.–500°C. to produce halogen compounds, such as methyl chloride and dichlormethane, dichlormethane and chloroform, chloroform and carbon tetrachloride from methane and chlorine.

157,281. SUPLHURIC ACID. A. Helbronner, 78, Boulevard Malesherbes, Paris, and P. Pipereaut, 49, Rue St. Georges, Paris. International Convention date, April 29, 1918.

Hot sulphurous gases and nitrous gases pass downwards through a series of chambers or cells arranged in cascade form to a series of condensing tubes leading from the lowest cell to a collecting vessel. The nitrous gas is always in large excess and the nitrogen peroxide formed is recovered in the collecting vessel. This vessel is connected to a series of six small lead towers, the acid from the first three of which is returned to the middle cell of the series. Nitric acid, water, dilute sulphuric acid and nitrous sulphuric acid are introduced into cells higher in the series. The gas from the last of the lead towers passes to a Gay-Lussac tower.

157,318. LOW TEMPERATURE CARBONISATION. Firm of G. Polysius, Dessau, Germany. International Convention date, February 1, 1918.

Coal is passed continuously through a horizontal rotating externally-heated retort, where it is distilled at low temperature and the coke is discharged into a vertical shaft. The volatile products are drawn off at the inlet end of the retort by a fan, and passed through a condenser. The gas is passed into the lower end of the vertical shaft and is pre-heated in passing through the hot coke on its way to the retort to complete the cycle. Surplus gas may be drawn off from the pipe before entering the shaft.

LATEST NOTIFICATIONS.

160,433. Manufacture of anthraquinone derivatives. Babwerke vorm. Meister, Lucius & Brüning. March 11, 1920.

160,454. Process for the extraction of atmospheric nitrogen from nitrogen compounds of titanium. Guignard, G.P. March 19, 1920.

160,455. A method of extracting zinc from lead slags, zinc-retort residues, poor zinc ores, and the like. Bergwerks & Spieker. March 17, 1920.

160,172. Processes for the production of bicarbonate of soda and of ammonium chloride. L'Air Liquide, Soc. Anon. Pour L'Etude et L'Exploitation Des Procedes. G. Claude. March 17, 1920.

160,180. Bodies for filling columns, towers, or the like through which gas is passed in an opposite direction to liquid. Petzel, G. March 17, 1920.

160,427. Method of producing high temperatures and reducing refractory oxides. Pacz, A. March 19, 1920.

Specifications Accepted, with Date of Application

127,549. Ammonia, Process for recovering, from coke-oven and like gases. Soc. Industrielle de Produits Chimiques. May 27, 1918.

136,141. Nitro-cellulose and its compositions, Method of reducing the viscosity of viscous solutions of. O. Carlsson and E. Thall. December 6, 1918.

139,758. Gas-purifying apparatus. C. Bourdon. March 6, 1919.

145,599. Grinding or crushing mills. H. Cramm. May 15, 1914.

146,114. Methane, Manufacture of. Farbwerke vorm. Meister Lucius & Bruning. July 1, 1919. Addition to 146,110.

147,000. Pyridine bases, Manufacture of. Farbwerke vorm. Meister, Lucius & Bruning. August 30, 1918. Addition to 146,869.

149,927. Metal oxides and other compounds of metals, Production of. New Jersey Zinc Co. July 22, 1919.

152,643. Oxygen and nitrogen, Process for separating—and apparatus therfor. M. Zack. October 15, 1919.

159,530. Ores or other materials, Furnaces for subjecting to the action of gases and the like. British Oxygen Co., Ltd. S. W. Bray and I. H. Balfour. October 9, 1919.

159,532. Iron and titanium and vanadium, Treatment of minerals or products containing. B. P. F. Kjellberg. October 20, 1919.

159,602. Rubber, Manufacture of. S. C. Davidson. December 1, 1919.

159,659. Tin, Purification of—or the production of tin salts from crude tin. J. J. Collins. December 10, 1919.

159,709. Nitrogen, Electrodes for oxidising. F. H. Loring. December 31, 1919.

159,780. Cement materials, magnesite and the like, Method of burning or calcining—and apparatus therefor. A. Hauenschild. April 28, 1920.

159,802. Mineral tars other than coal tar, Process of treating. W. Anderson and J. Meikle. October 31, 1919.

159,905. Illuminating and other gases, Purification of. W. O. Felt. September 22, 1917.

159,908. Distillation furnaces. G. Heeley. September 8, 1919.

159,925. Pulverising or fine grinding Process and apparatus for, F. Seymour. November 7, 1919.

159,960. Catalytic iron, or catalysts containing catalytic iron Process for the manufacture of. Nitro-Fixation Syndicate, Ltd. and H. C. Jenkins. December 5, 1919.

159,987. Rubber, Process for devulcanising. C. F. Willard. December 9, 1919.

160,114. Oil, Apparatus for the extraction of, from oleiferous sandstone, shale or the like. T. H. Oswald and A. D. Dixon-Brown. July 7, 1920.

Applications for Patents

Plauson, H. Manufacture of hydrocarbons from carbonaceous substances, &c. 7,160. March 5.

Potter, C. K. Manufacture of chromium compounds. 6,690. March 1.

Preston, J. T. E. Recovery of ammonium compounds from coal, &c. 7,237. March 7.

Shadbolt, S. M. Apparatus for drying solid chemicals. 6,679. February 29.

Soc. Anon. des Matières Colorantes et Produits Chimiques de Saint-Denis, and Wahl, A. R. Chlorotoluenes. 7,014. March 3. (France, March 6, 1920).

Soc. Chimique des Usines du Rhone, anciennement Gilliard, P. Monnet, et Cartier. Process for manufacture of oxyaldehydes and their derivatives. 6,289. Feb. 24. (France, March 24, 1920).

" Process for manufacture of oxyaldehydes and their derivatives. 6,450. Feb. 25. (Germany, June 9, 1920).

Soc. of Chemical Industry in Basle. Manufacture of mordant dyeing dye-stuffs and chromium compounds thereof. 6,030. Feb. 22.

Soutar, C. W. Manufacture of anthraquinone dye-stuffs. 6,063. Feb. 23.

Stone, G. de Holden-. Cooling liquids, gases, &c., by other gases. 6,808. March 1.

Szarvasy, I. Manufacture of pure retort carbon. 6,645. February 28. (Hungary, January 29, 1918).

" Manufacture of methyl alcohol from methyl chloride. 7,142. March 4. (Hungary, July 16, 1914).

Thermal Industrial and Chemical (T.I.C.). Research Co., Ltd. Treatment of peat, &c. 7,883. March 12.

Titanium Pigment Co., Inc. Manufacture of composite titanic-oxide products. 6,618. February 28.

Tulloch, T. G. Recovery of salts from their solutions. 6,026. Feb. 22.

Vielle, J. A. Manufacture of hydrocarbons from car onaceous substances, &c. 7,160. March 5.

Patents Court Cases

AN application has been made under Rule 7 of the Patents (Treaty of Peace) Rules, 1920, by British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London, for a licence in respect of Patent 18,736/1908 (R. Lanch), relating to the manufacture of an orange lake dyestuff. Any notice of opposition must be given by April 25, 1921.

The following patents have been endorsed "Licences of Right" under Sect. 24 of the Patents and Designs Acts, 1907 and 1919: 22,746/1913 (E. Collett), relating to the concentration of nitric acid, and 146,546 (C. W. Bailey and others), relating to ammonium sulphate.

WAGES IN THE CHEMICAL TRADE were discussed at a conference in London on Tuesday by the officials of the various trade unions affected, men from the workshops, and the workers' representatives on the Joint Industrial Council for the industry. The question was again under discussion at a meeting of the Joint Industrial Council held on Wednesday at the Ministry of Labour. The workpeople's representatives intimated that they were not in a position to accept the employers' amended terms, and made an offer of arbitration, which was refused. Mr. H. J. Wilson, of the Ministry of Labour, then intervened, and it was decided to postpone the operation of the reduction from the first until the third week in April, to give the union representatives an opportunity of holding meetings of the men at the various works in order to explain the position, and to take a decision regarding the communication to be made to the employers.

AMERICA'S DYE IMPORTS from Great Britain during February comprised 200 lb. Dianol Fast Blue 2B and 300 lb. Durasol Acid, Blue B.

It is announced that the LONGWORTH BILL for the protection of the United States coal-tar chemical industry has not been passed by Congress.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, MARCH 31.

Owing to holiday influence, the market has been stagnant during the past week and there is little of fresh interest.

General Chemicals

ACETONE has been in good enquiry—stocks are materially reduced and command a higher figure.

ACID ACETIC maintains its better tendency although the demand during the past week has only been nominal.

ACID CITRIC.—Unchanged.

ACID FORMIC.—The demand is very dead, but stocks are small, and with the revival in trade a better standard of value may be realised.

ACID OXALIC has only been in small demand, but the price still shows a firmer tendency.

ACID TARTARIC maintains its value although orders are scarce.

BLEACHING POWDER.—There is little business to report and export markets are apparently still overstocked.

COPPER SULPHATE continues on the down-grade owing to the complete absence of export business.

FORMALDEHYDE is still a hand-to-mouth market, but the article seems to have found its level whilst stocks are limited.

LEAD ACETATE is quite uninteresting.

POTASH BICHROMATE.—There is no evidence that the reduction in price has stimulated the demand.

POTASH CAUSTIC is lower in price on Continental offering.

POTASH PRUSSIATE is only in nominal enquiry but stocks are firmly held.

SODA ACETATE has been rather quieter but no change in value is indicated.

SODA BICHROMATE is slow of sale and, in spite of the makers' cut in the price, the market is still controlled by re-sale parcels.

SODA CAUSTIC is still without a market and the price continues to droop.

SODA HYPOSULPHITE maintains the recent improvement and, with the oncoming season, the demand is expected to improve.

SODA NITRATE.—Only a nominal business is reported but the tendency is firmer.

SODA PRUSSIATE is not much enquired for, but makers hold to their price.

Coal Tar Intermediates

Trade continues slow and there is practically nothing of interest to report. Many works are closed down this week.

ANILINE OIL AND SALT still continue idle owing to the lack of export demand, but prices are nominally unchanged.

BETA NAPHTHOL is quietly steady, but very little business is reported.

DI NITRO PHENOL is slightly more active, and there seems to be a slightly larger export enquiry.

DIMETHYANILINE is easy in the absence of any fresh business.

NITRO BENZOLE is quietly steady without change in price.

PARANITRANILINE is without feature, but the value is maintained.

PARAPHENYLENEDIAMINE is in small request at last-quoted figures.

RESORCINE is only called for occasionally, but supplies are on the light side.

SALICYLIC ACID is a better market, but the price is very firm.

Coal Tar Products

The market generally for coal tar products is still very inactive. Many works have taken the opportunity to close for a week during the Easter season.

90's BENZOL.—Can be bought at 2s. 7d. per gallon on rails in the North and 2s. 9d. to 2s. 10d. in the South.

PURE BENZOL.—Is quiet at 2s. 10d. on rails in the North and 2s. 11d. in the South.

CREOSOTE OIL.—There is a fair amount of business doing in creosote oil, although the price is not too strong. Business has been done at 8¾d. on rails in the North and 9½d. to 10d. in the South.

CRESYLIC ACID.—Is very quiet and the nominal price is about 2s. 6d. for the Pale quality and about 2s. 3d. to 2s. 4d. for the Dark.

SOLVENT NAPHTHA.—Can be bought at 2s. on rails.

HEAVY NAPHTHA.—Is quiet at 2s. 2d. per gallon.

NAPHTHALENE.—Is also quiet and is quoted from £8 to £14 per ton for Crude and £24 to £27 per ton for Refined.

PITCH.—The demand remains quiet and the downward tendency still continues. To-day's values are approximately 65s. to 70s. f.o.b. East Coast, and 75s. to 80s. f.o.b. London.

Sulphate of Ammonia

The position remains unchanged. The price for export to British Colonies during April/May has been reduced to £16 per ton f.o.b.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	95	0	0	to	100	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst	ton	69	0	0	to	70	0	0
Carbolic, cryst. 39-40%	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	2	3	to	0	2	5
Formic, 80%	ton	80	0	0	to	85	0	0
Gallic, pure	lb.	0	4	9	to	0	5	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	42	10	0	to	45	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	0	10	to	0	0	11
Phosphoric, 1.5	ton	55	0	0	to	57	0	0
Pyrogallic, cryst	lb.	0	9	6	to	0	9	9
Salicylic, Technical	lb.	0	1	2	to	0	1	4
Salicylic, B.P.	lb.	0	1	3	to	0	1	5
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	9	to	0	1	10
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to	—		
Ammonia, chloride	ton	65	0	0	to	70	0	0
Ammonia, muriate (galvanisers)	ton	55	0	0	to	57	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	55	0	0	to	60	0	0

	per	£	s.	d.		£	s.	d.
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	8
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	20	0	0	to	21	0	0
Borax crystals	ton	34	0	0	to	36	0	0
Calcium acetate, Brown	ton	15	0	0	to	17	0	0
,, Grey	ton	23	0	0	to	25	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	39	0	0	to	40	0	0
Cream Tartar, 98-100%	ton	140	0	0	to	150	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	120	0	0	to	122	10	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts, commercial	ton	6	0	0	to	7	0	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	50	0	0	to	52	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	55	0	0	to	57	0	0
Litharge	ton	38	10	0	to	40	0	0
Lithopone, 30%	ton	30	0	0	to	32	10	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	75	0	0	to	78	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	ton	145	0	0	to	150	0	0
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	48	0	0	to	50	0	0
Potassium bichromate	lb.	0	0	9½	to		—	
Carbonate, 90%	ton	85	0	0	to	90	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	290	0	0	to	205	0	0
Nitrate, refined	ton	58	0	0	to	60	0	0
Permanganate	lb.	0	2	6	to	0	2	9
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt	3	15	0	to		—	
Seconds	cwt	3	10	0	to		—	
Sodium acetate	ton	35	0	0	to	37	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	7½	to	0	0	8
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	26	0	0	to	27	0	0
Nitrite, 96-98%	ton	50	0	0	to	52	0	0
Phosphate, crystal	ton	25	0	0	to	27	0	0
Perborate	lb.	0	1	9	to	0	2	0
Prussiate	lb.	0	0	8½	to	0	0	9
Sodium Sulphide, crystals	ton	20	0	0	to	23	0	0
Sulphide, solid, 60-62%	ton	40	0	0	to	41	0	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	3	to	0	2	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	1	8	to	0	1	9

	per	£	s.	d.		£	s.	d.
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	0	to	0	3	3
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	4	9	to	0	5	0
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	7	6	to	0	8	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	9	6	to	0	10	0
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	0	to	0	5	3
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	0
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthalene	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	5	9	to	0	6	0
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	3	to	0	8	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	0	8	9	to	0	9	0
Salol	lb.	0	3	6	to	0	3	9
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

Cardiff By-Products

CARDIFF, WEDNESDAY.

Sulphate of Ammonia—	
For home consumption (per ton o.t.)	£24 11s.
For export (per ton f.o.b.)	£20 to £30
National Benzole (per gallon)	3s. to 3s. 6d.
Solvent Naphtha (per gallon)	2s. 6d. to 2s. 8d.
Heavy Naphtha (per gallon)	2s. 10d. to 3s.
Crude Naphthalene Salts (per ton)	£9 to £15
Pitch (per ton)	100s. to 120s.
Creosote (per gallon)	11d. to 1s.
Motor Benzol (per gallon)	2s. to 3s. 5d.
Crude Benzol (per gallon)	1s. 9d. to 2s.

The review of the GERMAN FINE CHEMICAL TRADE in 1920 by the *Chemiker Zeitung* shows that wide fluctuations in prices were general. The foreign demand for fine chemicals during the first two months of the year was considerable, and resulted in wild speculation. Prices were highest in February, but by May they had fallen considerably. September saw a slight recovery, but the last few months of the year were characterised by a severe decline.

Manchester Chemical Market

Sir S. W. Royse & Co., Ltd., Manchester, in their monthly market report state :—

CHEMICALS.—A rather better enquiry has been perceptible this month, but, though prices generally are somewhat steadier, little improvement in actual business can be reported, and manufacturers are finding considerable difficulty in keeping their works going. The demand from the textile trades is quiet and present prospects are not bright. Sulphate of copper has been in better request for export account at the lower prices, but little has been doing for home consumption. Green copperas is firmer owing to reduced production. There has been some pressure to realise stocks of acetate of lime, but acetates of lead and soda have been steadily called for. Nitrate of lead is dull. Carbonate of potash and caustic potash are in fair request, but nothing is doing in Montreal potashes. Only a moderate business has been passing in prussiates of potash and soda, but the market is firmer owing to uncertainty as to further Continental supplies. There has been a good demand for white powered arsenic and stocks of both foreign and Cornish have been reduced. Tartaric acid has moved slowly for near delivery, but the forward position is firmer. Cream of tartar has been in somewhat better request, but citric acid is unchanged. To meet the keen competition from abroad, British makers of bichromates of potash and soda have just reduced their prices about 2½d. per lb. Oxalic acid is dearer with the possibility of curtailment of supplies from Germany. Early in the month, prices of borax and boracic acid were reduced £4 and £5 per ton respectively and there is a steady enquiry. Phosphate of soda continues to be offered freely from stock. Alum and sulphate of alumina are unchanged. With a view to stimulating export trade, makers of lump salammoniac reduced their prices by £25 per ton, but so far the response has been poor, and there has also been little call for muriate of ammonia. Bleaching powder and caustic soda are in slow demand and outside supplies are on the market at competitive prices, Chlorates of potash and soda have been in better request, but stocks are ample. Business remains very quiet in tar products and values generally are lower. There is a moderate demand for benzoles for motor purposes, and prices are steady. Toluoles are neglected. Enquiries for solvent naphtha are for spot delivery only, and values if anything are easier. There has been a slackening in demand for creosote and lower figures are accepted. Naphthalene continues to be pressed for sale at lower prices. Practically nothing has been doing in any grade of carbolic acid. Pitch continues weak and low prices are being accepted for near delivery.

SUNDRIES.—American pearl starch has been offering at lower figures and has commanded more attention especially for forward shipment; stocks here are lighter. Only a limited business has been done in Japanese farina, and trade in the Dutch product has been confined to small lots from stock. Dextrine has been in steady request at lower prices. Sulphate of barytes has been moving more freely. Trade in turpentine continues small, there being very little confidence in the market. Paraffin wax and scale are only in poor demand and prices are lower. Superphosphate continues in good request, and heavy shipments are arriving. There has been a fair enquiry for bone meal and makers are well supplied with orders. Cod liver oil has fallen about 50s. per barrel during the month.

Recent Wills

Dr. J. C. Cain, of Aylestone Avenue, Brondesbury Park, N.W., for some years editor of the *Journal* and other publications of the Chemical Society, chief chemist at Dalton Works of British Dyes, Ltd., and, during the War, a member of the High Explosives Department at the War Office £8,528

Mr. H. Bell, of Haining Croft, Hexham, Northumberland, chairman of Henry Bell & Sons, woolstaplers, fellmongers and artificial manure manufacturers ... £102,745

Mr. G. Frost, J.P., of Ashbourne Road, Derby, chemist ... £28,254

Mr. E. R. Groschke, of Billiter Street, London, E.C., sulphate of ammonia merchant ... £60,579

Company News

ANGLO-PERSIAN OIL CO.—Allotment letters of the recent issue of 3,500,000 nine per cent. cumulative second preference shares have been posted. It is understood that applications up to 200 shares will receive full allotment.

LEVER BROTHERS, LTD.—A Stock Exchange announcement authorises (under Temporary Regulation 4 (3)) dealings in £4,000,000 seven per cent. 1st Mortgage Debenture stock, issued at 92½ per cent., of which £5 per cent. is paid, and fully paid, after issue of allotment letters. These securities will rank *pari passu* with those in which special settling days have already been appointed as soon as they are identical and the Certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

BRITISH DYESTUFFS CORPORATION.—The accounts to October 31 last show that the revenue available for distribution amounts to £610,927. After deducting preference dividends at the rate of 7 per cent. per annum there remains £419,921. The directors recommend a dividend on the preferred ordinary shares at the rate of 8 per cent. per annum, less tax, calculated on the amount paid up on those shares, which will absorb £216,616, leaving to be carried forward £203,305. The trading results, which cover a period of general trade activity, have been satisfactory. Continuous progress has been made in extending the company's manufacturing equipment, but the erection of some important plants has not yet been completed, and this has prevented the company from meeting in every instance the demand for its dyestuffs. During the two years of the company's existence a total amount of £593,486 has been written off the values of the associated companies' buildings and plants. A total sum of £289,366, including capital outlay, has been expended upon research during the same period. The board recognises the vital importance of continuous research to the dye-making industry, and is making provision for this purpose.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Sydney ...	Aluminium ware	362
Charleroi ...	Gas coal; pitch	372
Budapest ...	Varnishes	375
Seville ...	Drugs; chemicals; paints ...	380
Norrkoping	Chemicals	383
Manchuria ...	Glassware	386

Tariff Changes

AUSTRALIA.—In respect of shipments made on and after April 1 the granting of licences for the importation of non-British dyes into the Commonwealth, whether from stocks in the United Kingdom or otherwise, will be subject to the production of a permit issued by the High Commissioner's Office. Exporters of foreign dyes to Australia should first communicate with the High Commissioner's Office, Australia House, Strand, London, W.C.2.

FRANCE & ALGERIA.—The export duty on oilcake is altered to 5 fr. per 100 kilogs. (gross weight) on edible oilcake and 1 fr. per 100 kilogs. (gross) on other oilcake. These duties supersede those of 2½ fr. per 100 kilogs. on sulphated cake for manure, and 10 fr. per 100 kilogs. on other cake fixed in January last. The restrictions on the importation into France and Algeria of cellulose pulp have been withdrawn.

GREECE.—The restrictions imposed on the import of carbide of calcium into Greece have now been raised.

ITALY.—Sulphate of copper, zinc dross and other zinc waste and manganese ore may now be exported without a Ministerial licence. A licence is now required for the export of lead and zinc ores.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

CAMPBELL, A. C. C., and PHILLIPS, O. F., and PIKE, H. L., carrying on business as glass bottle manufacturers at Fox's Lane, Hackney, and Chatham Place, Hackney, under the style of Evans & Co., by mutual consent as and from December 31, 1920. All debts will be received and paid by A. C. C. Campbell and H. L. Pike, who will in future carry on the business at Chatham Place, Hackney, under the name of Evans & Co.

Companies Winding Up Voluntarily

EAGLE CREEK OIL CO. (CALIFORNIA), LTD.—A meeting of creditors will be held at 40-42, Broad Strcet Avenue, London, E.C., on April 7, at 11 a.m. W. G. Newman, Liquidator.

LONDON FINE CHEMICALS, LTD.—A meeting of creditors will be held at 69, Broad Street Avenue, London, E.C., on Wednesday, April 6, at 12.30 p.m. A. A. Hall, Broad Street Avenue, London, Liquidator.

PREMIER GLASS MANUFACTURING CO., LTD.—Mr. A. J. Harper, 35, Copthall Avenue, London, E.C. 2, Liquidator.

SOUTH-WESTERN TRADES MUTUAL PLATE GLASS INSURANCE CO., LTD.—F. W. Fuller, of Weymouth, Liquidator.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

BRITISH LIANOSOFF WHITE OIL CO., LTD., London, E.C.—Reg. March 15, deb., to La Lianosoff Française (Société Anonymé), 34, Rue de Chateaudun, Paris, securing a sum or sums not exceeding £20,000; general charge. *Nil. Jan. 14, 1921.

NEW BRADSHAW'S ASPHALTE CO., LTD., London, E.C.—Reg. March 17, charge, to London County Westminster and Parr's Bank, Ltd., securing all moneys due or to become due to the Bank; charged on property comprised in conveyance dated Feb. 15, 1921. *—. Jan, 19, 1920.

SILVER SPINGS BLEACHING AND DYEING CO., LTD., Timbersbrook.—Reg. March 15, agreement increasing rate of interest payable on £21,000 debentures, outstanding to executors of the late R. G. Young, and others charged on land, works and premises at Timbersbrook, also general charge. *£23,082. Sept. 4, 1920.

VULCAN ARC WELDING AND TRANSPORT CO., LTD., Liverpool.—Reg. March 11, £643 debentures, to T. A. Norris, 79, Seabank Road, Wallasey; general charge.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BELL, J. R., 190, Ravensworth Road, Dunston, chemist, £12 14s. 6d., Feb. 9.

MATTHEWS, E., High Street, Royston, chemist, £27 1s. 6d., Feb. 22.

RASSI, A., 6, St. George Terrace, Regents Park Road, manufacturing chemist, £28 10s. 10d., Feb. 16.

SMITH, P. P., Westgate, Bradford, chemist, £22 7s. 3d. Feb. 16.

NEWMAN, A. P., 51, Thompson Street, Barry Dock, chemist, £10 4s. 11d., Feb. 15.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

SUTTON TRADING CO., LIMITED, 101, Exchange Buildings, Mount Stuart Square, Cardiff, coke and fuel merchants, &c. Nom. cap.: £2,000 in 2,000 shares of £1 each. Directors: To be appointed by subscribers. Qualification of Directors: one share.

WARD'S SHODDY MANURES, LIMITED, 175, Chillingham Road, Heaton, Newcastle-upon-Tyne. Merchants and manufacturers of manures and fertilisers. Nominal capital: £1,000 in 1,000 shares of £1 each. Directors, B. Ward (Chairman), W. Ward. Qualification of directors one share. Remuneration of directors: £1,000, to be divided.

Soap Manufacturers' Affairs

Meeting of Creditors

AT a meeting of the creditors of Dulac, Ltd., soap manufacturers, &c., 2, Aspen Place, Waterloo Street, Hammersmith, London, W., held recently, a statement of affairs was presented by Mr. Booth, the liquidator which showed liabilities of £3,759 2s. 3d. The assets were estimated to realise £3,028 0s. 5d., from which had to be deducted £400 due on debentures and £132 3s. 6d. for preferential claims. The net assets were thus reduced to £2,495 16s. 11d., or a deficiency as regarded the unsecured creditors of £1,263 5s. 4d. The assets comprised cash at bank and in hand, £26 10s. 9d.; stock in trade, £551 10s.; machinery and plant, £1,098 15s.; fixtures, fittings, and utensils, &c. £217 13s. 3d.; office furniture, £44 14s. 6d.; book debts, £231 8s. 11d.; and boxes, cartons, labels, &c., £1,714 16s. 1d., expected to produce £857 8s. The issued share capital of the company was £5,890, and as regarded the contributories there was a deficiency of £7,153 5s. 4d.

Mr. Booth said that when the company was formed £500 was paid to Mr. Villain, technical director, in consideration of it having the exclusive right to the use of his formulæ and secret processes. They were, however, to remain his property until a sum of £5,000 had been paid to him by way of dividend on the 2,500 deferred shares he subscribed for.

In May, 1920, a factory was obtained at Peckham for £1,000, but subsequently it was found that to adapt the building to the requirements of the company would cost a considerable amount of money, and they eventually decided to sell the premises for a sum of £2,000. A little later, negotiations were entered into for the acquisition of a business known as the Angelique Chemical Co., which was eventually acquired at a cost of £1,300. The company then occupied the factory which had been previously used by the Angelique Chemical Co. The premises were held under an agreement at a rental of £300 per annum, and a sum of £1,300 had been expended in connexion with extra fittings and additional shafting and machinery. Between September and December orders to the extent of £2,500 were obtained, but were not executed as the materials ordered from France did not arrive in time. The company actually commenced manufacturing their own goods last October, and prior to that date there was no turnover created. The books of the company showed that the actual turnover between October and the date of the liquidation was £1,207. He (Mr. Booth) had since obtained orders to the value of nearly £400, most of which had been executed. Last October Mr. Hesford was taken ill and had been unable to attend to the business regularly. Last December debentures for £400 were created and issued for cash. On February 8 last he (Mr. Booth) was appointed as Receiver for the debenture holders. He was in negotiations with several intending purchasers and hoped to be able to effect the sale of the business as a going concern.

After a short discussion the creditors decided to confirm the voluntary liquidation of the company with Mr. Booth as liquidator, and an advisory committee was also appointed.

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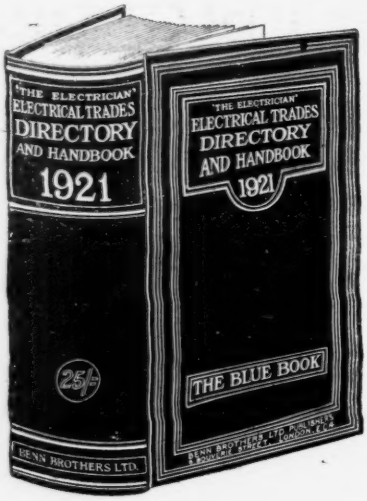

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